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Bibliography on Weather Modification, p. 1433

6 October 1955 No. 10

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

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SUBSCRIPTION RATE: $8.00 per year to members and non members. Single and back issues $2.00. Back volumes, $10 per volume.

This publication has been made possible through support and sponsorship extended by the Geophysics Research Directorate of the Air Force Cambridge Research Center, Air Research and Development Command, under Contract No. A. F. 19 (604)-302.

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 6 OCTOBER, 1955 No. 10

SPECIAL FEATURE IN THIS ISSUE

An Annotated Bibliography on Weather Modification

by
Geza Thuronyi

(For complete table of contents see back cover)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 3 Joy Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references on a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm Detect.
9. Condensation Trails	10. Clim. of N.E. Africa	11. Mountain Met.	

Vol. III, 1952

1. Clim. of N.W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V, 1954

1. Oceanog. Met.	2. Clim. of S.E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Bibliographies published this year are:

1. **Bibliography of Bibliographies on Meteorology,** Vol. 6, No. 1, Jan. 1955
2. **Textbooks and Monographs Containing Subject Bibliographies,** Vol. 6, No. 2, Feb. 1955
3. **Storm Surges,** Vol. 6, No. 3, March 1955
4. **Ionospheric Propagation,** Vol. 6, No. 4, April 1955
5. **Photochemistry of Upper Atmosphere,** Vol 6, No. 5, May 1955
6. **Cloud Physics,** Vol. 6, No. 6, June 1955
7. **Radar Cloud Physics,** Vol. 6, No. 7, July 1955
8. **Atmospheric Nuclei (1841–1950),** Vol. 6, No. 8, Aug. 1955
9. **Atmospheric Nuclei (1951–1955),** Vol. 6, No. 9, Sept. 1955
10. **Weather Modification,** Vol. 6, No. 10, Oct. 1955

Forthcoming bibliography will be:

11. **Cooling Power and its Measurement,** Vol. 6, No. 11, Nov. 1955

Other bibliographies in preparation are:

Actinometers	*Night Airglow*
Arctic Synoptic Meteorology	*Ocean-Atmosphere Energy Exchange*
Climate of the Arctic	*Ozone*
Cosmic Rays in the Atmosphere	*Singularities*
Fog Forecasting	*Snow Cover*
Indoor Climatology	*Synoptic Aerology*
Microwave Propagation	*Tropical Cyclones*

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

See also: **Met. Office Centenary,** 6.10–18; **Spread of oak pollen by wind** (Fedorova), 6.10–248.

6.10–1 551.46(08)

Texas. Agricultural and Mechanical College. Dept. of Oceanography, **Collected Reprints in Oceanography and Meteorology.** No. 1–30, **1950–1954.** One piece [420 p.] figs., refs., eqs. **DWB**—About 30 articles on various phases of oceanography, written by Dale F. Leipper, head of the Dept. of Oceanography and a dozen other authors connected with that department, are reprinted in this edition. Articles by Bates, Leipper, Saucier, B. W. Wilson and K. Hidaka have been abstracted separately. Many articles are on engineering aspects of offshore oil drilling operations or on marine biology, or geology or climatology. *Subject Heading:* **1. Oceanography reprint collections.**—*M.R.*

6.10–2 51(08) 532.59

Wave motion and vibration theory. Ed. by Albert E. Heins. Pub. by McGraw-Hill Book Company, N. Y., for The American Mathematical Society, **1954.** 169 p. figs., tables, refs., eqs. *Symposium in Applied Mathematics of the American Mathematical Society, Proceedings,* Vol. 5. **DWB, DLC**—The book is a compendium of 15 papers presented at the June 16–17, 1952 symposium at the Carnegie Institute of Technology. The subjects covered include: Lin, C. C., **Hydrodynamic stability;** Chandrasekhar, S., **Instability of fluid motion in presence of a magnetic field;** Garabedian, P. P., **Free surface flows;** Levine, Harold, **Acoustic radiation pressure;** Carrier, G. F. and Munk, W. A., **Diffusion of tides into permeable rock;** Stocker, J. J., **Radiation conditions;** Montroll, — and Greenberg, —, **Scattering of plane waves by soft obstacles.** *Subject Headings:* **1. Applied mathematics symposia 2. Wave motion theory 3. Hydrodynamics. I. American Mathematical Society II. Heins, Albert E. (ed.) III. Munk, Walter H.**—*M.R.*

6.10–3 551.46(08)

International Union of Geodesy and Geophysics. Association of Physical Oceanography, Rome, Sept. 14–25, 1954, **Procès-Verbaux.** pub. Bergen, Norway, **1954.** 299 p. figs., tables, refs., eqs. Its *Procès-Verbaux,* No. 6. Price: 30 Sh. **DWB**—Volume lists officers, scientific and executive committees for 1951–54 (Proudman, president), officers, executive committee and scientific committees appointed at Rome in Sept. 1954; Storm surges committee (H. Mosby of Bergen, president); terms of reference of committees; Report of secretary; Financial Report (1951–54); names of delegates and guests at Rome; agenda; list of 74 papers besides 20 National or Institutional Reports; and, finally, the actual reports and many of the papers (*see* Part III, p. 889, June 1955, *MAB*). A number of these will be abstracted separately. *Subject Headings:* **1. Oceanography 2. Oceanographic symposia 3. I.U.G.G. Association of Physical Oceanography.**—*M.R.*

6.10–4 551.46:06(082.1)

National Institute of Oceanography, Surrey, England. **Collected reprints.** vol. 1, **1953.** 61 reprints. **DN-HO**—This bound volume brings together reprints of 61 papers on various aspects of oceanography, collected from a number of journals published in 1950–53. A few of them have meteorological interest and most of these have already been abstracted. The volume is available for exchange with other institutions but is not on sale. *Subject Headings:* **1. Oceanography reprint collections.**—*C.E.P.B.*

TEXTBOOKS

See also: **Origin and development of cyclones** (Zubian), **6.10–141.**

6.10–5 551.510.535:551.507.362(02

Burgess, Eric, **Frontier to space.** Foreword by the Astronomer Royal, Sir Harold Spence Jones. London, Chapman & Hall, **1955.** 174 p. numerous figs. (incl. photos), tables, 1 refs. **DLC**—A highly readable book giving in 8 well illustrated chapters the latest informatio on rockets and rocket exploration of the high atmosphere, and the basic scientific informatio gained from such studies of the ionosphere, solar and cosmic radiation and the exospher Results gained from balloon measurements and from indirect methods are incorporated i these chapters. Evidence from meteors, the counter glow, aurora and cosmic ray measure ments at the surface are especially well treated. The final chapter describes the orbital c space ship, giving many theoretical technical details which must be known and improved o before the satellite observatory becomes a reality. *Subject Headings:* **1. Rocket exploratio of the upper atmosphere 2. Cosmic radiation 3. Satellite observatories 4. Textbook** —*M.R.*

6.10–6 551.5(02

Kolobkov, N. V., **Vozdushnyĭ okean i ego zhizn'.** [The atmospheric ocean and its life. Moscow, **1954,** 182 p. 56 figs., photos, foot-refs. **DLC**—A popular (40,000 copies issued text by the author of **Grozy i Shkvaly** (Thunderstorms and squalls. *See item* 5.8–4, Aug 1953, *MAB*), covering many unusual phenomena in the atmosphere, as well as: 1) chapte giving the usual description of atmospheric structure (3-color model to 300 km included composition, methods of upper air observation, etc. The successive chapters cover: 2) a mospheric electricity, 3) lightning and thunder and laboratory experiments on lightnin 4) thunderstorms, 5) thundershowers and heat, 6) storms and hurricanes, tornadoes, dus storms, 7) combatting the fearful forces of nature, 8) high atmospheric phenomena (noctilucen clouds and auroras) and 9) optical phenomena (green flash, mirage, rainbows, halos, corona and dust). *Subject Headings:* **1. Severe storms 2. Optical phenomena 3. Popular textbook** —*M.R.*

6.10–7 551.513(02

Pogosian, KH. P., **Tsirkuliatsiia atmosfery.** [Atmospheric circulation.] Leningrad Gidrometeorologicheskoe Izd-vo, **1952.** 119 p. 52 figs., 5 tables, 44 refs. **DLC**—Th monograph on the general atmospheric circulation is designed for students of hydrometeoro logical institutes and for meteorologists and is largely qualitative in nature. The five chapter are: (1) distribution of temperature over the earth and the fundamental features of the tem perature and pressure fields including the scheme of the general circulation, vertical an horizontal stratification of temperature and seasonal characteristics of the topography of 50 mb isobaric surface, and charts of the relative topography and annual variation of the mea temperature of the layer between 500 and 1000 mb; (2) the role of the atmosphere as it i influenced by the distribution of continents and oceans, nonadvective temperature change and temperature differences between land and water in the formation of the mean temperatur field of the troposphere in the Northern Hemisphere; this chapter includes discussions of th nonadvective changes of mean temperature on isobaric surfaces between 500 and 100 mb, etc. (3) the mean temperature and pressure fields and their roles in the genesis of the genera atmospheric circulation including the relationship between pressure fields and the surfac of the earth and in the troposphere, cyclonic and anticyclonic activity in Jan. and July an the structure of the thermobaric pole, climatological frontal zones, trade wind monsoon circula tion, etc.; (4) anomalies of the atmospheric circulation including general characteristics an the anomaly of 1939/40 and seasonal anomalies; (5) atmospheric circulation and the moistur cycle. *Subject Headings:* **1. Atmospheric circulation anomalies 2. Nonadvective temperatur changes 3. Pressure fields 4. Meteorology textbooks.**—*I.L.D.*

MONOGRAPHS

See also: **Pyrheliometers** (Georgi), 6.10–77.

6.10–8 551.578.46:551.582(794)

†*Miller, David H., **Snow cover and climate in the Sierra Nevada, California.** California. Univ., University of California Publications in Geography, v. 11, **1955.** 218 p. 11 figs., 78+5 tables, bibliog. p. 195–213. **DLC**—The general problem of the energy relationship between the earth's surface and the atmosphere and the resulting climatic and meteorological consequences is investigated by a thorough analysis of the climatic anomaly in the crest regions of Sierra Nevada of California, where the classic description of climate over a snow cover, namely nocturnal and diurnal temperature, is found wanting. "In spite of a deep, persistent snow pack, the energy level of the region, expressed as rapid melting of snow, moderately warm nights, and warm days, is generally high." This characteristic of the local climate is explained in terms of its relationship to topography, circulation of the upper air and to its heat exchanges with forest and snow. The contents of this monograph are as follows: thermal characteristics of the climate of the Sierra Nevada (winter and spring insolation, long wave radiation, winter and spring temperatures, weather types and weather periods); the upper air circulation over the Sierra (temperature of the upper air, topography of constant pressure surfaces aloft, curvature of shear lines of air flow, pattern in atmospheric circulation, elements of radiation balance, the heat economy of the earth's surface); the role of the open forest in the local climate (the effect of forest cover upon insolation, heat transfer from foliage by convection and transpiration, exchange of long wave radiation between crowns and snow and effect of forest upon climate); physics of the snow cover (winter and spring albedo, long wave radiation exchange between snow surface and air, conductivity of snow cover, influence of melt water, condensation and evaporation, influence of physical phenomena on the snow cover upon its heat economy) and the total heat economy of the Sierra Crest region during winter and spring. The appendix includes a description of the topography of the Sierra Crest region and of the environment of the observation stations; a survey of the areal distribution of the climatic elements in this region and a comparison of the temperature during the four year period 1946–47 to 1950–51 with longer periods. Observational and calculated data are presented in tables. This monograph is not only a valuable contribution to quantitative physical climatology, in particular to an understanding of local climate in terms of the interrelationship between specific physical geographic factors and the upper air circulation, but is also a valuable contribution to the methodology of climatology. *Subject Headings:* **1. Climate over snow cover 2. Snow cover 3. Climate of Sierra Nevada, California 4. Forest microclimatology 5. Sierra Nevada, California.**—*I.L.D.*

6.10–9 551.577

*Florida. Div. of Water Survey and Research, **Summary of observed rainfalls on Florida to Dec. 31, 1952.** Its *Water Survey and Research Paper*, No. 11, Aug. 31, **1954.** 334 p. 12 plates, mostly tables. **DWB**—Rainfall records for Florida from 419 stations totaling 78,728 station months and obtained from 21 other agencies besides the U. S. Weather Bureau (which had 80% of the records available) have been diligently searched out and corrected, compiled and analyzed since 1947 and published in detail in this huge volume. The charts include rainfalls equalled or exceeded one year in ten, one year in two and every year for year as a whole and for each month. Data as well as isohyets appear on each chart. The tabular data include records at stations in operation after Dec. 31, 1947 (active stations), by sections of the state, and stations inoperative but with 10 years or more record. Elaborate station indexes and location maps are included showing active and inactive stations, respectively. In addition to the total rainfall (in inches) for each month and year during the entire period of record for each station there is in most cases an analysis of the amount of rainfall which was equalled or exceeded on 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100% of the years in any given month. Data for Key West date back to 1832. In each case the years when data were incomplete in any given month are indicated in a separate tabulation. *Subject Headings:* **1. Rainfall data 2. Rainfall frequency data 3. Florida.**—*M.R.*

6.10–10 551.5(09):06

†**L'Institute Royal Météorologique de Belgique.** [The Royal Meteorological Institute of Belgium.] Preface by F. H. van den Dungen. Introduction by E. Lahaye. Pub. by the Institute, **1954.** 215 p. numerous figs. (incl. photos). **Publications of the Institute,** p. 201–207. **DWB**—A beautiful publication, similar to that issued by the Netherlands Weather Service in commemoration of their 100th anniversary (1854–1954). (*See item* 5.10–7, Oct. 1954, *MAB.*) The fields of emphasis in the Belgian Service are: 1) climatology and bioclimatology, 2) theoretical and experimental aerology, 3) synoptic meteorology and forecasting, 4) radiation studies, 5) upper atmosphere and ionosphere physics, 6) geomagnetic and geoelectric (prospecting) studies, 7) atmospheric electricity and radioactivity. History of the service, which dates back to QUETELET and his suggestion for an observatory at Brussels in 1823, which was realized in 1827. Observations, instrumentation, exposures, buildings, personnel and research activities, publications, etc. are thoroughly treated with many illustrations. *Subject Headings:* **1. History of meteorology 2. Brussels Observatory 3. Belgian meteorological service. I. Belgium. Institut Royal Météorologique.**—*M.R.*

6.10–11 551.585:016

†Knoch, Karl and Schulz, Alfred, **Methoden der Klimaklassifikation.** [Method of climatic classification.] *Petermann's Geographische Mitteilungen, Ergänzungsheft,* No. 249, **1952.** 78 p. 2 figs., 5 tables, 10 maps (colored, fold. in pocket), bibliog. of 314 refs. **DWB**—A comprehensive review and comparison of all known schemes of climatic classification, and partial classification. A discussion of the problems involved in classification, and a thoroughgoing bibliography (arranged by author) on the subject. Climatic tables and 10 charts of Europe, according to SUPAN (1916), HETTNER (1930), KÖPPEN-GEIGER (1928), PHILIPPSON (1933), WISSMANN (1939), BLAIR (1949), GORCZYŃSKI (1945), THORNTHWAITE (1933) and CREUTZBERG (1950) are presented. The particular scheme to be used must be determined in the light of the particular use for which it is to serve (e.g., agricultural, hydrological, comfort, air mass analysis). *Subject Headings:* **1. Climatic classifications 2. Bibliography on climatic classification 3. Europe.**—*M.R.*

6.10–12 551.509.5:016

†Gringorten, Irving I., **Methods of objective weather forecasting.** *Advances in Geophysics,* ed. by H. E. Landsberg, 2:57–92, **1955.** 3 tables, 6 figs., 124 refs. **DLC**—This is the first comprehensive coverage of the entire field of what is known in the United States and Canada as *objective weather forecasting.* It differs from numerical forecasting in that elaborate calculations and machines for making these calculations need not be involved. It does, however, involve use of rational statistical methods, and the results should be comparable, regardless of who makes the forecast. It also should give an answer in terms of the probability that the predicted event will occur. The author recognizes the limitations of the method and the need for a compromise with subjective methods, if any great skill is to be attained in forecasting. The devices used in objective forecasting are: 1) algebraic formulas derived from theory, 2) algebraic formulas determined empirically, 3) linear or curvilinear regression, 4) scatter diagrams, eye fitting or graphical stratification, 5) contingency tables or tabulations of historical data, 6) the analogue, 7) lists of rules. The predictors are classified according to (1) surface observations, (2) upper air observations, (3) surface synoptic charts, (4) upper air charts. Then the various predictions are classified according to continuous predictands (minimum or maximum temperature, precipitation, relative humidity, cloud tops, turbulence), attributes in classes (ceiling, visibility), and dichotomies (occurrence of precipitation, thunderstorms, snow, tornado, fog, frost, icing, contrails, gusts). New techniques, such as sets of nomograms to determine simultaneous values of two continuous parameters, registers of records, as worked out by U. S. Weather Bureau and G.R.D. are treated. Accuracy and present or future trends are discussed in final chapters. The excellent bibliography consists of 124 items, mainly 1950–1954 material not contained in the MAB Bibliography on Objective Forecasting published in May 1952. *Subject Headings:* **1. Objective forecasting methods 2. Bibliography on objective forecasting.**—*M.R.*

6.10–13 551.509.3

*§U. S. Office of Naval Operations, **Guide to Arctic forecasting, Pt. 1.** Its *NAVAER* 50-1P-505, reprinted Dec. 1, **1953.** 70 p. 107 figs., 4+3 tables, 7 refs. **DWB**—Climatological Summaries Nov. through March for the Aleutian Islands, Bering Sea and Western Alaska areas are presented. Statistical summaries, based on a two-year sample, of various weather elements and their probability of occurrence at weather ship "Sugar" are set forth in the form of a contingency table. Two abnormal weather patterns with the associated synoptic climatology for the Arctic area are included with a discussion of the techniques used in developing these types. Track charts of high and low-pressure areas, and comments relative to their value as an aid in forecasting, are presented for the Northern Hemisphere Arctic area. Discussions of some specific forecasting techniques applicable to the Arctic area are included. *Subject Headings:* **1. Weather forecasting 2. Arctic weather forecasting 3. Climate of the Arctic 4. Arctic.**—*Author's abstract.*

GENERAL GEOPHYSICS AND METEOROLOGY

ORGANIZATIONS

See also: **Oceanography symposia** (I.U.G.G.), 6.10–3; **Royal Met. Inst. of Belgium,** 6.10–10.

6.10–14 551.509.2/3:06

Tannehill, Ivan Ray (*U. S. Weather Bureau, Wash., D. C.*), **First Session of the Commission for Synoptic Meteorology (CSM), April 1953.** *American Meteorological Society, Bulletin,* 34(6):253–255, June **1953. MH-BH**—CSM had its beginning in 1907 at the Paris meeting of IMO, as the Commission on Weather Telegraphy, and in 1923 it became the Commission on Synoptic Weather Information (CSWI). In 1946 at Paris and in 1947 at Toronto and Washington, major revisions were undertaken, because of wartime changes and increased international aviation activities. After 6 years of trial, only minor revisions were necessary in the 1947 codes and specifications. However, 131 items were included on agenda of 1953 CSM session at Washington. Three working committees were established: (A) Codes and specifications and graphical presentation; (B) Telecommunications, international exchanges and frequency of observations; and (C) Networks, technical regulations, cloud atlas and publications. Accomplishments, representation at session and six scientific lectures given at 28 day session are outlined (April 2–29, 1953). *Subject Headings:* **1. WMO. Synoptic Meteorology Commission 2. WMO. meetings 3. Synoptic meteorology.**—*M.R.*

6.10–15 551.5:06(26)

Bilancini, R., **Il centenario della prima Conferenza Meteorologica Internazionale.** [Centenary of the first International Meteorological Conference.] *Rivista di Meteorologia Aeronautica,* 13(4):64, Oct./Dec. **1953. DWB**—Mention of the first International Conference of Naval Officers held for peaceful purposes (Aug. 23, 1853 at Brussels) and the fact that O. M. Ashford in **Weather** (May 1953) says that the Executive Commission of the WMO states wistfully 99 years later that it would be desirable to have a certain amount of uniformity in the registration of maritime meteorological observations. *Subject Headings:* **1. Marine meteorology conferences 2. Maritime Conference, Brussels, 1853 3. Brussels. I. Maury, M. F. II. Ashford, O. M.**—*M.R.*

6.10–16 551.585.53:06

UNESCO. Advisory Committee on Arid Zone Research, 7th Session, Paris, May 4–7, 1954, **Compte-rendu.** ed. by L. J. Tison, Secretary of the I.U.G.G. *I.U.G.G. Bulletin d'Information,* 3(6):341–364, July **1954.** Recommendations in English. **DWB**—Agenda of 7th session, list of participants, activities of special agencies (e.g., WMO with respect to wind use and weather modification) and member states (e.g., Israel has established a Desert Region Research Institute), reports on research done and in course (15 contracts are listed and names of those completing the work given), program for 1955–6, plans for symposium on wind and

solar energy in arid zone to be held Oct. 22–26, 1954, in New Delhi, India, and list of 18 recommendations and explanation of each. *Subject Headings:* **1. Arid zone research 2. Arid zone conferences. I. Tison, L. J.**—*M.R.*

6.10–17 551.510.53:06

Conference on Motions in the Upper Atmosphere, Albuquerque, Sept. 7–9, 1953, **Proceedings.** ed. by H. K. Kallmann. *International Union of Geodesy and Geophysics, Bulletin d'Information* 3(6):299–339, July **1954.** Includes list of delegates and papers presented (all resumés except opening paper by Sydney Chapman.) **DWB**—The conference was sponsored by the National Science Foundation, Washington, D. C., and Univ. of New Mexico at Albuquerque. Forty delegates attended and 27 papers were read and are listed. Abstracts (some lengthy) of all but one paper are presented. The opening paper by SYDNEY CHAPMAN is published *in extenso.* (See item 6.10–117.) *Subject Headings:* **1. Upper atmosphere conferences 2. Ionospheric wind 3. Conferences 4. Albuquerque, N. M. I. Kallmann, H. K.** (*ed.*).—*M.R.*

6.10–18 551.5:061.1(09)(41)

Meteorological Office Centenary 1855–1955. *Meteorological Magazine*, London, 84(996): 161–198, June **1955. DWB**—This issue is devoted almost entirely to centenary articles. It includes a message from the Secretary of State for Air, a Foreword in which the Director of the Meteorological Office briefly traces the advance of meteorology since 1855, and a series of articles (abstracted separately): Bull, G. A., **Short history of the Meteorological Office;** Simpson, Sir George, **Fitzroy and weather forecasts;** Gold, E., **The Meteorological Office and the First World War;** Stagg, J. M., **The Meteorological Office and the Second World War;** Sutcliffe, R. C.; Best, A. C. and Peters, S. P., **The Meteorological Office faces the future;** Gold, E., **The Meteorological Office and the International Organization.** *Subject Heading:* **1. History of British Meteorological Service.**—*C.E.P.B.*

6.10–19 551.5:061.1

Sutcliffe, R. C., **Scientific research and development.** *Meteorological Magazine*, London, 83(996):183–187, June **1955.** *Also:* Best, A. C., **Services for Aviation and Defense.** *Ibid.*, p. 187–191. *Also:* Peters, S. P., **Forecasting and public services.** *Ibid.*, p. 192–196. ports. **DWB**—SUTCLIFFE points out that research is now a specialist occupation. He refers especially to the promise of future developments in the Meteorological Office, in forecasting research, climatological research, the Meteorological Research Flight and the instrument developing group. BEST surveys the increasing need of aircraft for reports and forecasts both for landing and in flight at increasing heights and possible future needs, e.g., for landing in a confined space, guided missiles, etc. PETERS describes the various forecasting services available to different users (apart from aviation) and discusses possibilities in extended forecasting and use of electronic computers. *Subject Heading:* **1. Meteorological service development.**—*C.E.P.B.*

EXPEDITIONS AND OBSERVATORIES

See also: **Polar expeditions bibliog.** (Bonnlander, Belmont), 6.10–29; **History of observatories, U.S.S.R.** (Shcheglov), 6.10–36; **Antarctic upper air temps.** (Schumacher), 6.10–173.

6.10–20 91.04(99)

Deutsche Antarktische Expedition, 1938/1939, **Wissenschaftliche und fliegerische Ergebnisse.** [Scientific and aeronautical results of the German Antarctic Expedition, 1938/1939.] Ed. by Alfred Ritscher. Leipzig, Koehler K Amelang, **1942.** 1 vol. in two pts. Pt. 1, Text. 304 p. 56 figs. (incl. photos in color, fold. charts), tables, 14 refs. Pt. 2, Illustrations and charts. 57 plates, 3 charts (fold. in pocket). **DWB**—These two volumes contain little meteorological information except of a general nature, but contain a large amount of cartographic, glaciological and geographical information and charts, photos and accounts of expedition. Pictures of the meteorologists launching and following a radiosonde (REGULA

nd LANGE) are found on p. 34–35 of Pt. 1. *Subject Headings:* **1. German Antarctic Expedition, 938/39 2. Antarctic expeditions 3. Antarctica. I. Ritscher, Alfred** (*ed.*) **II. Deutsche orschungsgemeinschaft III. Regula, Herbert.**—*M.R.*

6.10–21 551.5:91.04

Robin, G. de Q., **Queen Maud Land expedition.** *Marine Observer*, 23(160):105-108, pril **1953.** 3 figs., 2 photos. **DWB**—General account of the work of the Swedish-Norwegian-ritish expedition 1949–1952. *Subject Headings:* **1. "Maudheim" Expedition, 1949–1952 Antarctica 3. Queen Maud Land.**—*C.E.P.B.*

6.10–22 551.501.9(99)

§Veldkamp, A. J., **Nederlands meteorologisch waarnemingsstation in het Zuidpoolgebied.** Dutch meteorological observation station in the Antarctic.] *Hemel en Dampkring*, 52(10): 82–185, Oct. **1954.** 2 figs. **MH-BH**—The locations of permanent weather stations in the icinity of the Antarctic in the South Atlantic and Indian Oceans are listed, the role of whaling ips in the collection of weather data, including Dutch ships is discussed; the circulation of outh pole region, pressure, temperature, and cloud conditions are described briefly. A synoptic hart and a map of the Antarctic region are reproduced. *Subject Headings:* **1. Meteorological tations 2. Antarctica.**—*I.L.D.*

6.10–23 551.5:06

Hori, Takeo, **Hokkaido University Institute of Low Temperature Science.** *Polar Record*, Cambridge, Eng., 7(48):194–195, July **1954. DLC**—Note describing equipment of the nstitute (workshops, laboratories and six cold chambers in which a minimum temperature f −57°C may be produced) and activities of its six sections (pure physics, meteorology, iology, medicine, applied physics, oceanography). The Institute of Low Temperature cience at Hokkaido University was founded in Nov. 1941; it is headed by TAKEO HORI ho is also head of the pure physics section. SEKIJI OGIWARA is in charge of the meteorology ection with four assistants. (For similar article, *see item* 5.5–14, May 1955, *MAB.*) *Subject leadings:* **1. Sapporo, Japan. Hokkaido Univ. Institute of Low Temperature Science Low temperature research.**—*G.T.*

6.10–24 551.501.9:551.43(45)

Fanchiotti, Sergio, **Accorgimenti usati presso la stazione di M. Cimone nella misura di lcuni elementi meteorologici durante il periodo invernale.** [Devices used at the Mt. Cimone tation for measuring various meteorological elements during the winter season.] *Rivista i Meteorologia Aeronautica*, 13(4):29–34, Oct./Dec. **1953.** 7 figs. Italian, French, English nd German summaries p. 29. **MH-BH**—The Monte Cimone Scientific Research Observatory or Aeronautical Meteorology located at 2164 m (7000 ft) above sea level on Monte Cimone the northern Appenines in the Province of Modena is equipped with a variety of new or pecially adapted instruments for meteorological observations in such exposures (where snow nd ice hinder functioning of anemometers, psychrometers and precipitation gages, etc.). he instrumental equipment is described in some detail and the station and some of the quipment are illustrated. Most of the exposed instruments are electrically heated to remove e. The view from the observatory in most directions is excellent, as it is the highest peak ereabouts. *Subject Headings:* **1. Meteorological observatories 2. Mountain observatories Meteorological instruments 4. Monte Cimone Observatory, Italy.**—*M.R.*

BIOGRAPHY, EDUCATION AND HISTORY

BIOGRAPHY

6.10–25 551.5:92

Professor Carl-Gustaf Rossby, Symons Medallist, 1953. *Weather*, 8(6):168, June **1953.** hoto. **DWB**—Note on life and work. Born Stockholm 1898, occupied various positions U. S. since 1926. *Subject Headings:* **1. Biography 2. Rossby, Carl-Gustav.**—*C.E.P.B.*

6.10–26 551.5:9

Conrad, Victor, **Reinhard Süring, 1866–1950 [obituary].** *American Meteorological Society Bulletin*, 33(2):52, 55, Feb. **1952. MH-BH**—SÜRING's major contributions to meteorolog as a scientist and administrator and the titles of his more important contributions are listed *Subject Headings:* **1. Süring, Reinhard 2. Obituaries.**—*I.L.D.*

6.10–27 551.5:9

König, Willi, **Nachruf auf Professor Dr. August Schmauss.** [Obituary of Dr. Augus Schmauss.] *Zeitschrift für Meteorologie*, Berlin, 8(11/12):321–322, Nov./Dec. **1954. DWB** Also: KÜTTNER, Joachim, **Zum Tode von August Schmauss.** [On the death of A. Schmauss. *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(1/2):131–133, **1955.** photo **DWB**—The first article is a sketch of the life of AUGUST SCHMAUSS and an account of h scientific contributions to meteorology. In the second article KÜTTNER expresses appreciatio of SCHMAUSS's character as a "romantic" meteorologist. *Subject Headings:* **1. Biograph 2. Schmauss, August.**—*I.L.D., C.E.P.B.*

6.10–28 551.5:9

Dr. O. G. Sutton, *Meteorological Magazine*, London, 82(977):321–322, Nov. **1953.** photo 8 refs. **MH-BH**—Summary of professional life and researches on micrometeorology. Directo of Meteorological Office from Sept. 1, 1953 and President, R. Met. Soc. for period beginnin Oct. 1953. *Subject Headings:* **1. Biography 2. Sutton, O. G.**—*C.E.P.B.*

BIBLIOGRAPHY

6.10–29 551.513:016(98,99

†Bonnlander, B. H. and Belmont, A. D., **Bibliographies on polar atmospheric circulation** McGill Univ. Arctic Meteorology Research Group, Contract AF 19(604)-1141, Appendix to Status Report, No. 5, June **1955.** unpaged. 440 items. **DWB**—This excellent collectio of abstracts and references to literature and data sources on the circulation of the polar regio begins with a section on **Especially Significant Papers**—the first two of the 31 being reports o **Arctic Meteorological Surveys** by BELMONT. Additional references (305) grouped by period (before 1930, 1930–38, 1939–45, 1946–49 and 1950–54), contain a fairly exhaustive coverag of available literature. A third section on **Expeditions** contains about 85 references to ove 50 expeditions from 1873–1952. Section IV covers 15 data serials from various countrie and Section V, 6 major bibliographies from which some material has been drawn. Reference are made to *MAB* abstract number in many cases rather than copying the abstract. *Subje Headings:* **1. Polar aerology bibliographies 2. Arctic bibliographies 3. Bibliography o polar atmospheric circulation.**—*M.R.*

6.10–30 551.5:016:01

†Canada. Meteorological Div., **Technical Circular Index, 1–174, 1946–1953.** Its *CI* 2476, TEC-185, April 30, **1954.** 32 p. looseleaf. 3 sections: **List of Technical Circular in chronological order. Subject Index. Alphabetical Author Index. DWB**—Authors, title and subject references to 174 technical circulars of the Canadian Meteorological Servic arranged chronologically in the first part, and indexed by subject (atmospheric circulatio atmospheric disturbances, climatology, Arctic, agriculture, tropical, forestry, clouds, clou physics, fog, humidity and evaporation, instruments, dynamics, stations and observatorie precipitation, icing, artificial precipitation, pressure, synoptic analysis, local forest studie temperature and wind) in Pt. 2. *Subject Headings:* **1. Canada. Meteorological Div. Tech nical circulars 2. Subject indexes 3. Author indexes 4. Canadian meteorological literatur 5. Meteorology bibliographies 6. Canada.**—*M.R.*

6.10–31 551.5:016 551.515.2:01

†Hatakeyama, H. and Isono, K., **Meteorological researches in Japan during 1951–195** *I.U.G.G. Bulletin d'Information*, 3(6):273–288, July **1954.** bibliog. p. 279–288. **DWB**— Advances during 1951–53 by government and university research institutes in Japan in dynami meteorology, typhoon studies, synoptic meteorology and aerology, micrometeorology, radiatio

ıd optics, cloud and precipitation physics, snow and ice, troposphere, radio meteorology, imatology, instruments and calamities are first reviewed under each of these 11 headings, ıd then a list of 295 references to literature published in over 20 Japanese journals is pre- nted, classified under these 11 heads. The work on typhoons, turbulence and micro- eteorology or climatology is especially noteworthy. Not much success is claimed for nu- erical prediction work, though it appears hopeful. *Subject Headings:* **1. Meteorological search 2. Bibliography of Japanese meteorological literature 3. Typhoon bibliographies Japan.**—*M.R.*

EDUCATION

6.10–32 551.5:37

Argentina. Servicio Meteorológico Nacional, **El Doctorado en Ciencias Meteorológicas ı la Universidad de Buenos Aires.** [Doctor's Degree in Meteorological Sciences, at the niversity of Buenos Aires.] Its *Publicaciones*, *Ser. E*, No. 16, **1953.** 53 p. **DWB**—An aborate publication describing the curriculum and each separate course required for the 5 ears of study at the University of Buenos Aires for the Doctorate in Meteorology. *Subject eadings:* **1. Meteorological education 2. Buenos Aires. University 3. Doctorate in eteorology.**—*M.R.*

6.10–33 551.5:06

Canada. Meteorological Div., **Opportunity for employment (of) university graduates.** s *CIR*-2379, PER-78, Nov. 12, **1953.** 7 p. (Amendment, No. 1, re salaries.) **DWB**— vil service careers, salaries, conditions of employment, opportunity for further education nile on the job and duties of grade 1 meteorologist-forecaster (salary $3360 to $4620 a year), ıd application procedure are specified. The Canadian service has 7 grades of meteorologist. ighest grade salary $6420–$7200 per annum. *Subject Headings:* **1. Careers in meteorology Canadian Weather Service.**—*M.R.*

6.10–34 001.89:408

Holmstrom, J. E. (*UNESCO, Paris*), **The language problem of science.** *Research*, ondon, 7(5):190–195, May **1954.** fig. **DLC**—The author states the language problem as flected in a diagram taken from a draft UNESCO report. It would appear from this diagram ı estimated frequency of languages used and number of scientists understanding them, that er 50% of the one million scientific contributions published every year cannot be read by least half the scientists interested in them. The author discusses three possible methods for rrecting this situation, i.e., (1) translating services (problem of terminology, educational quirements of good translator, mechanical translating devices, etc.); (2) language studies r scientists (both in early education and during professional work) and (3) use of widely ıown languages in scientific publications. *Subject Heading:* **1. Language problem.**—*G.T.*

HISTORY

See also: **Centenary of first International Met. Conf.** (Bilancini), 6.10–15; **Met. Off. Centenary,** 6.10–18.

6.10–35 628.1(09)(624)

Murray, G. W., **Water from the desert: some ancient Egyptian achievements.** *Geo- ıphical Journal*, 121(2):171–181, June **1955.** 2 figs., 4 photos, foot-refs. **DWB**—A huge ım was built in the Wadi el-Garawi 7 mi SE of Helwan in 2750 B.C., designed to contain the rgest flood in the Wadi, possibly to provide drinking water for alabaster quarries. There ere no spillways and owing to miscalculation of the volume of runoff the first heavy fall 0 mm or more) overflowed and destroyed it. Deep wells were dug in the desert between 60 and 1161 B.C. and artesian wells in Dakhla and Kharga oases before 905 B.C. Collecting lleries, underground cisterns and embanked fields were used to collect surface water. *Subject eadings:* **1. History of water supply 2. Egypt.**—*C.E.P.B.*

6.10–36 551.501.9:522(0

Shcheglov, V. P., **Iz proshlogo russkoĭ nauki.** [From the past of Russian science *Astronomicheskiĭ Zhurnal*, Moscow, 29(4):476–489, **1952.** 6 figs., 2 tables, 7 refs. **DLC-** An historical outline of activity of the Tashkent Astronomical Observatory from its foundatic to the October revolution is presented. After having described the motives and circumstanc of its organization and the gradual phases of the Observatory's development, the auth summarizes the results of scientific activities carried out during the period and points out t importance of the work done in the fields of climatology and geophysics. *Subject Heading* **1. History of observatories 2. Tashkent Astronomical Observatory, Uzbekistan, U.S.S.R.**— *A.M.P.*

APPLIED METEOROLOGY

MARINE METEOROLOGY AND OCEANOGRAPHY

See also: **Oceanography and met.** (Texas A. and M. Coll.), 6.10–1; **Oceanography symposia** (I.U.G.G.), 6.10–3; **Collected reprints, Oceanography** (Nat. Inst. of Oceanogr., Eng.), 6.10–4; **Maritime conferences** (Bilancini), 6.10–15; **Ice fluctuations in North Atlantic** (Maksimov), 6.10–245.

6.10–37 551.5:656.61(261.3) 551.311.18(261.

§*Hamburg. Deutsches Hydrographisches Institut, **Ostsee-Handbuch, Mittlerer Te 1942,** [Baltic Sea, Central Part, 1942.] Hamburg, **1949** and **1953.** 2 v. Its *No.* 200 Vol. 1, pub. **1949.** 392 p. 274 figs., charts, tables. Bound separately and laid in pocket vol. 1: Its **Nachtrag 1952 zum Ostsee-Handbuch, Mittlerer Teil, 1942. v. 1.** pub. 195 v. 2, pub. **1953.** 380 p. figs. no. 275–576. Bound separately and laid in pocket of vol. Its **Nachtrag, 1952 . . . vol. 2.** pub. **1952. DWB**—On p. 59–60 of vol. 1 the storm warni and weather services of Sweden, U.S.S.R. and Finland are discussed briefly. Conditions und which storm warnings are issued or displayed are specified. Climate and weather, includi data on temperature, wind, storm, precipitation, snow and fog, monthly wind rose charts a sample synoptic charts illustrating cold wave, fog, storm and fair weather situations in t Gulf of Finland and adjacent land areas of Finland, Sweden, the U.S.S.R. are given on p. 8 115. On p. 118–139 an extensive discussion of ice conditions in Baltic and various harbo and a supplement on wind and current effects on ice and ice data on p. 30–35 of the Nachtra *Subject Headings:* **1. Coast pilots 2. Marine climatology 3. Ice conditions in Baltic 4. Balt Sea.**—*M.R.*

6.10–38 551.509:656

Rodewald, Martin, **Ist der moderne Seeverkehr noch vom Wetter abhängig?** [Is mode sea traffic still dependent on weather?] *Umschau*, 54(8):225–227, April 15, **1954.** 3 fig **DWB**—Wind and sea may make a difference of 5% in the duration of a passage of even a knot ship (one-third due to wind, two-thirds to sea), the effect increasing with the load carri but greatest when periods of ship's roll and waves coincide. Settled conditions such as mo soons call for "climatic navigation" modified by temporary departures ("weather navigation" The work of a marine weather and storm warning service is described (N. Atlantic cha Sept. 13, 1951). The chief need at present is for extended forecasts for the oceans. *Subj Headings:* **1. Marine meteorology 2. Marine navigation.**—*C.E.P.B.*

6.10–39 551.5:656

§Rodewald, Martin, **Zur Frage: meteorologische Navigation.** [On the question: meteor logical navigation.] *Wetterlotse*, No. 75:169–181, Sept. **1954.** 5 figs. **DWB.** Also hi **Gedanken zur meteorologischen Navigation.** [Ideas on meteorological navigation.] *Ibi* No. 77:201–213, Oct. **1954.** fig. Also in: *Seewart*, Hamburg, 15(5), Oct. **1954. DWB** The first article distinguishes between: 1) climatic, 2) general weather (Witterungs-) a 3) weather (Wetter-) navigation. Example of (1) is planning routes for average monso conditions, of (2) for monsoon in operation in a given year, of (3) 12–48 hr. forecasts of monso fluctuations. A number of examples are also given for weather conditions in North Atlant

with charts. The second article, referring to the first, discusses further the economic and navigation aspects of wind and weather at sea, including sailing routes in relation to ice and hurricanes. *Subject Headings:* **1. Marine meteorology 2. Marine navigation.**—*C.E.P.B.*

6.10–40 551.5:551.461.2(261.3)

Wyrtki, Klaus, **Schwankungen im Wasserhaushalt der Ostsee.** [Fluctuations in the volume of the Baltic.] *Deutsche Hydrographic Zeitschrift*, 7(3/4):91–129, **1954.** 15 figs., 7 tables, 26 refs. German, English and French summaries p. 91. **DWB**—The components of the balance of volume of the Baltic are analyzed for each month, including the effect of west winds on exchange with the North Sea, first the monthly average for 1926–35 and then for the separate years 1926–30 and annually for 1898–1952. The exchange with the North Sea is greater than was formerly supposed. The atmospheric circulation exercises an effect through precipitation and influx of river water and also through its direct effect on sea level. The salinity balance is evaluated. *Subject Headings:* **1. Sea level variations 2. Meteorological effects 3. Baltic Sea.**—*C.E.P.B.*

6.10–41 551.542.1:551.465(261.3)

Manegold, Walter, **Die Wetterabhängigkeit der Oberflächenströmungen in den Pforten der Ostsee.** [Dependence of surface currents in the entrance to the Baltic Sea on weather.] *Aus dem Archiv der Deutschen Seewarte*, Hamburg, 54(4), **1936.** 40 p. 7 tables, fold. charts. **DLC**—An elaborate study discussing the relation of weather situations, classified according to the location of high and low pressure areas and the paths of lows to strong in- or outflowing currents (342 cases) in the Danish Belts. The result is essentially that the direction of the current depends mainly on the pressure gradient over the region. Outflowing currents are connected with high pressure over Scandinavia or Northwest Russia. *Subject Headings:* **1. Sea currents 2. Pressure gradient 3. Danish Belts 4. Baltic Sea.**—*A.A.*

6.10–42 551.465

Fofonoff, N. P. (*Brown Univ., Providence, R. I.*), **Steady flow in a frictionless homogeneous ocean.** *Journal of Marine Research*, 13(3):254–262, Dec. **1954.** 2 figs., 4 refs., 22 eqs. **DLC**—A mathematical model is developed to study the free (frictionless) steady horizontal flow which can occur in a homogeneous ocean of constant depth. The flow satisfies the dynamic constraint that the vertical component of absolute vorticity is constant along a streamline. The conclusion is reached that in an enclosed ocean a free steady circulation cannot have any slow broad eastward currents. The eastward currents must occur as narrow streams of high velocity and high relative vorticity. Intensified currents are present along the eastern and western coasts. The theory which is developed for the homogeneous ocean of constant depth can be applied to the two-layer ocean if the horizontal divergence of flow is negligible. If the horizontal divergence is not negligible, then the intensification of poleward currents is more pronounced and that of equatorward currents less pronounced as compared with the homogeneous ocean. *Subject Heading:* **1. Dynamic oceanography.**—*Author's abstract.*

6.10–43 551.465:546.211

Miyake, Y.; Sugiura, Y. and Kameda, K. (*all, Met. Res. Inst., Tokyo*), **On the distribution of radioactivity in the sea around Bikini Atoll in June, 1954.** *Papers in Meteorology and Geophysics*, Tokyo, 5(3/4):253–263, Jan. **1955.** 10 figs., table, 6 refs. **DWB**—By the radioactivity in the air and sea water caused by the US hydrogen bomb tests in the area of Bikini-Eniwetok Atolls, 1954 radioactive contamination to fishes and fishing boats was brought about. The observation of the actual state of the radioactivity around Bikini-Eniwetok Atolls was carried out aboard the survey boat "Shunkostu-maru." The maximum radioactivity in sea water was 7025 cpm/l at 570 km west of Bikini and the influence of the radioactivity was recognized as far as about 2000 km from Bikini Atoll. Some oceanographic discussions on the horizontal as well as vertical distributions of the radioactivity in the sea are given. *Subject Headings:* **1. Radioactivity in ocean water 2. Bikini hydrogen bomb tests 3. Pacific Ocean.**—*Authors' abstract.*

HYDROLOGY

6.10–44 551.511:532.

Long, Robert R. (*Johns Hopkins Univ.*), **Some aspects of the flow of stratified fluids Pt. 1, A theoretical investigation.** *Tellus*, Stockholm, 5(1):42–58, Feb. **1953.** 4 figs., bibliog p. 58, 79 eqs. Also issued as Johns Hopkins Univ., Dept. of Civil Engineering. Contrac Cwb 8140, Technical Report, No. 2, Feb. **1953.** 36 p. 4 figs., bibliog. p. 35–36, 79 eqs **DWB.** Also: **Pt. 2, Experiments with a two-fluid system.** *Tellus*, Stockholm, 6(2):97–115 May **1954.** 22 figs., table, 10 refs., 31 eqs. **MH-BH**—This paper is the first of a series of tw relating to the problem of internal oscillations of a fluid in a gravity field with vertical gradient of density and velocity. The exact, steady-state equations of motion and continuity of a perfect liquid moving two-dimensionally, with an arbitrary vertical distribution of density and velocity are integrated once to yield a second-order differential equation. This equation i examined with regard to uniqueness and stability of the motion. A criterion is develope giving a sufficient condition for the motion to be uniquely determined by the configuratio of the topography over which the fluid moves. It appears, further, that the condition o uniqueness is also a condition that a certain integrated quantity, called the kinetic potentia of the motion, be a maximum. The suggestion is offered that this may correspond to a form of fluid instability. A detailed study is made in the special cases of a uniform basic velocity and a certain type of shearing flow. In either case, it is shown that an internal Froude numbe of about $\frac{1}{3}$ divides the motion into two states, one of which is called supercritical, the othe subcritical. From several viewpoints, these regimes are analogous to the corresponding state of flow of water in a channel. In the subcritical state the flow is in the form of standing wave patterns. When flowing supercritically, conditions may be favorable for the formatio of internal "hydraulic jumps." The second paper reports on an experimental investigatio of the flow of two superimposed layers of fluid over a barrier. The apparatus, the experimenta procedure and the experiments are described with the aid of photographs. The theory of th flow of a single fluid over a barrier is treated exhaustively. The theory of the flow of a two fluid system over a barrier is developed and the theoretical analysis is compared with th interfaces and free surfaces of the models. *Subject Headings:* **1. Fluid dynamics 2. Stratifie fluids.**—*Author's abstract, I.L.D.*

6.10–45 551.482.2(825.1

Gilardoni, Roberto José, **Importancia del Río Barrancas (cuenca superior del Rí Colorado).** [Importance of the Barrancas River (upper basin of the Colorado River). *Meteoros*, Buenos Aires, 4(3):230–239, July/Sept. **1954.** 6 figs. (incl. photos). Spanish an English summaries p. 230. **DWB**—A study of the hydrological characteristics of the Bar rancas River and of the geography of the upper basin of the Río Colorado (Argentina). Th existence of potential flood is pointed out and means of prevention by controlling lake level by natural dams, etc. are described. *Subject Headings:* **1. River hydrology 2. Río Colorado Argentina.**—*I.L.D.*

AERONAUTICAL METEOROLOGY

See also: **Wind forecasts for aviation** (Durst), 6.10–102; **Forecasting lake breeze . . .** (Hall), 6.10–103; **Lee waves in soaring** (Rovesti), 6.10–203; **Aircraft icing** (Bannon), 6.10–215; **Visibility, Zanderij Airport, Surinam** (Surinam Met. Service), 2.10–272.

6.10–46 551.5:629.1

Alabaster, R. C., **The operation and navigation of jet airliners.** *Institute of Navigatio London, Journal*, 6(3):213–237, July **1953.** 8 figs., eqs. Discussion p. 231–237. **DWB**– Analysis of most economical flight path of a jet aircraft, taking account of ambient temperatur winds and Mach number. Flight planning and inflight navigation are included. Appen III, The principle of the machmeter, includes relation between temperature and Mach numbe *Subject Heading:* **1. Optimum flight paths.**—*C.E.P.B.*

6.10–47 551.551:629.1

Crim, Almer D. (*Langley Aeronautical Lab., Langley Field, Va.*), **Gust experience of helicopter and an airplane in formation flight.** *U. S. NACA, Technical Note*, No. 3354, De

954. 2 p. 2 tables, 5 figs., 2 refs., 2 eqs. **DWB**—A single-rotor helicopter and an airplane ave been flown in formation in rough air for the purpose of measuring and comparing their esponses to gusts. Rough-air flights were also made by the helicopter alone at several different irspeeds over the same ground path. *Subject Headings:* **1. Helicopters 2. Gusts.**—*Author's bstract.*

6.10–48 533.6

Sandborn, Virgil A. and Slogar, Raymond J. (*Lewis Flight Propulsion Lab., Cleveland, hio*), **Study of the momentum distribution of turbulent boundary layers in adverse pressure radients.** *U. S. NACA, Technical Note,* 3264, Jan. **1955.** 79 p. 30 figs., eqs. **DWB**—Experimental evaluation and analysis were made of mean and turbulent terms of the equations f motion and the stress tensor at four stations in a turbulent boundary layer with a progressively increasing adverse pressure gradient. Evaluation of terms of stress tensor indicated hat ρv^2, ρw^2, and $-\rho uv$ are of equal order of magnitude, while ρu^2 is roughly four times larger ear the wall. The term $\partial v^2/\partial y$ of the y-direction equation of motion was found to be as large s any term of the x-direction equation. *Subject Headings:* **1. Equations of motion 2. Turulent flow 3. Turbulent boundary layer.**—*Author's abstract.*

6.10–49 551.551:551.557:551.507.352

Seal, Diana M. and Duncan, A. H., **V-g records from Sunderland (Hythe) aircraft (November 1945 to October, 1948).** *Farnborough, Eng., Royal Aircraft Establishment, Technical Note, No: Structures* 60, **1950.** 18 p. 8 figs., 5 tables. Mimeo. **GB-MO**—Vertical gust ecords covering 35,000 flying hours in BOAC Sunderlands on Far Eastern and Australian outes (1422 records) are analyzed and envelopes drawn for maximum accelerations once in 000 and 10,000 hours at different air speeds. Tables show frequencies of upward and downard accelerations. Maximum upward accelerations 2.8 g. Results are compared with ritish Civil Airworthiness Requirements. *Subject Headings:* **1. High level turbulence Airplane acceleration 3. Vertical velocities in gusts.**—*C.E.P.B.*

6.10–50 629.13

Vitale, A. James; Press, H. and Shufflebarger, C. C. (*Langley Aeronautical Lab., Langley ield, Va.*), **An investigation of the use of rocket-powered models for gust-load studies with an pplication to a tailless swept-wing model at transonic speeds.** *U. S. NACA Technical Note,* No. 3161, June **1954.** 36 p. diagr., photos. **DWB**—Flight tests in continuous rough ir at transonic speeds have been made of a tailless 45° sweptbackwing rocket model as part f a program to investigate the feasibility of using existing rocket-model techniques for obaining gust-loads information. The results of airplane flight surveys for determining a orking basis for forecasting and selecting suitable test days are presented. Use is made of ower-spectral methods of generalized harmonic analysis in presenting both the experimental nd calculated characteristics of load response in rough air of a configuration having low amping in pitch. *Subject Headings:* **1. Rocket powered airplane models 2. Gust loads.**—*NACA abstract.*

INDUSTRIAL METEOROLOGY

See also: **Water from the desert . . .** (Murray), 6.10–35; **Wind power installation** (Studiengesellschaft Windkraft), 6.10–191.

6.10–51 551.5:551.311.2

Noszti, Endre, **A tropikalizáciőről.** [Tropicalization.] *Magyar Technika,* Budapest, (3):161–164, March **1954.** 3 figs. **DLC**—Increasing exports of Hungarian industrial roducts to tropical countries make it necessary to introduce tropical research. Meteorological ctors in tropical regions having a destructive effect on materials are briefly discussed. The rincipal factors are temperature and relative humidity (graphs of their diurnal variation in eb. and Oct. in the Panama Canal region are presented); secondary meteorological factors re insolation, wind-driven sand and atmospheric salt. Methods of research (under natural

or experimental conditions) on weathering of materials are described. The establishment of a tropical institute in Hungary is urged. *Subject Headings:* **1. Tropical regions 2. Weathering of materials in tropics 3. Tropical meteorology research.**—*G.T.*

6.10–52 551.5:6

The weather. *Engineering News*, Wilmington, Del., March **1954.** p. 3–7. fig., photos **DWB**—Illustrated article showing activities of weather engineers in the du Pont chemical industry. Nearly every phase of operations is affected by weather and requires special study to determine best methods of dealing with the elements. *Subject Headings:* **1. Industrial meteorology 2. Chemical industries 3. Engineering meteorology. I. E. I. du Pont de Nemours & Co.**—*M.R.*

6.10–53 551.509:621.8 551.5:37:621.

Weather work for women. *Life*, Chicago, 38(13):8–10, March 28, **1955.** photos **DLC**—Pictures of a dozen TV weather broadcasters in New York, Detroit, Washington, D. C. and Houston (9 of them women) showing their methods of operation. Besides a smattering of knowledge of meteorology, often gained after going on the job by the means of briefing from professional meteorologists, the main qualifications are "good looks" and the ability to clown. One or two professional meteorologists are included, but their time must be divided between clowning and information. *Subject Headings:* **1. Television weather broadcasts 2. Television forecast dissemination 3. Careers in meteorology for women 4. United States**—*M.R.*

AGRICULTURAL METEOROLOGY

See also: **Wheat growth and baido condition** (Nakahara et al.), 6.10–264; **Adaptation of cattle . . .** (Bruyère), 6.10–265; **Comparison of climate with reference to Lac insect** (Davies), 6.10–266.

6.10–54 551.5(064)

Sapozhnikova, S. A. and Nekhotiaeva, O. V., **Gidrometeorologicheskoe obsluzhivanie sotsialisticheskogo sel'skogo khoziaĭstva.** [The hydrometeorological service for socialist agriculture.] *Priroda*, Moscow, 43(12):51–56, Dec. **1954.** 2 illus. **DLC**—The authors describe the exhibit of the hydrometeorological service at the All Union Agricultural Exposition. Some of the apparatus mentioned include a device for measuring the evaporation of soil moisture based upon the principle of hydrostatic weighing, etc. Brief accounts are given of the contribution of Soviet meteorology, of the research on microclimate being conducted by the Central Geophysical Observatory and its affiliated branches, of the agricultural meteorological services provided by the Central Institute for Forecasting, and of various agricultural meteorological stations in different parts of the U.S.S.R. The names and studies conducted by some of the more important agricultural meteorologists are listed and photographs of the exposition building and of a remote control meteorological station are reproduced. *Subject Headings:* **1. Meteorological exhibitions 2. Agricultural meteorology 3. U.S.S.R.**—*I.L.D.*

6.10–55 551.524 551.52

Sato, Shoichi (*Kyushu Agric. Exper. Station*), **On the simple methods of temperature observations in the paddy field.** *Journal of Agricultural Meteorology, Tokyo*, 9(3/4):96–98 Aug. **1954.** 2 figs., 3 tables. In Japanese; English summary p. 98. **MH-BH**—1) The approximate daily mean temperatures may be obtained by means of three or four observations a day at equal time-intervals. As the routine work in cultivating season, the observations of daily extremes of air-, water-, and soil-temperatures are the most convenient. 2) The average temperatures of the soil-strata may be easily deduced from the mean soil-temperature at 10 cm depth. *Subject Headings:* **1. Temperature measurements 2. Soil temperatures 3. Rice paddies.**—*Author's abstract.*

6.10–56 551.5:63

Antezana O., Octavio, **Importancia agrícola de la meteorología.** [Agricultural importance of meteorology.] *Nimbus*, 3(10/11):3–10, July/Dec. **1952.** fig., 6 refs. **MH-BH**—Discussion of the effect of harmful meteorological factors on crop production and of the usefulness of climatic statistics and of short and long range forecasts of the variations from normal in combatting the harmful effects or in planning. Temperature, humidity, illumination, winds, frost, etc. are considered important. A climagram for Cochabamba, Bolivia, is presented by way of illustration. The 11-year cycle and the movement of barometric troughs are cited as promising for long and short range forecasting for agriculture, respectively. *Subject Headings:* **1. Agricultural meteorology 2. Climagrams 3. Cochabamba, Bolivia.**—*M.R.*

FOREST METEOROLOGY

6.10–57 551.5:632.187

Arnold, R. Keith and Buck, Charles C., **Blow-up fires—silviculture or weather problems?** *Journal of Forestry*, Wash., D. C., 52(6):408–411, June **1954.** photos. **DLC, DA**—General discussion of the development of blow-up fires under the combined influences of: (a) ignition and burning pattern, (b) atmospheric conditions (inversions, convection winds, vertical air circulation), (c) topography and (d) surface burning conditions. Methods of fire control involve meteorological research and service (investigation of effect of air characteristics on fire behavior and prediction of critical atmospheric conditions) as well as forestry practices (modification of micrometeorological factors, like fuel temperature, fuel moisture and wind velocity). *Subject Headings:* **1. Forest fire control 2. Fire weather.**—*G.T.*

6.10–58 551.5:632.187

Barrows, J. S.; Schaefer, Vincent J. and MacCready, Paul B., Jr., **Project Skyfire. A progress report on lightning fire and atmospheric research.** In cooperation with Munitalp Foundation, Inc. *U. S. Forest Service. Intermountain Forest and Range Experiment Station, Ogden, Utah, Research Paper*, No. 35, Nov. **1954.** 49 p. 26 figs. (incl. photos.), 16 refs. **DWB**—The aim of Project Skyfire is to study the atmosphere and cloud factors influencing the occurrence, the behavior and control of lightning fires and the possibility of modifying lightning storms by cloud seeding. This report discusses the characteristics of lightning fires including their occurrence and places of origin in western forests and the relations of occurrence to elevation, the life cycle of lightning fires, early research program, the Munitalp Research Program cloud survey methods, training of cloud survey personnel, identification of jet stream with clouds, estimation of wind velocity by cloud appearance, surface winds and the jet stream, relationship between weather types and lightning, estimating of convective cloud base height from dry-bulb-wet-bulb temperatures, cloud breeding areas, measurement of atmospheric electricity and of freezing nuclei, wide angle and 3-dimensional photography and meteorological approach to reducing fire dangers. *Subject Headings:* **1. Forest fire control 2. Lightning fires 3. Project Skyfire 4. Fire weather 5. Jet stream clouds 6. Cloud seeding. I. Munitalp Foundation, Inc., New York.**—*I.L.D.*

6.10–59 632.187:551.551

Scesa, S. and Sauer, F. M., **Possible effects of free convection on fire behavior—laminar and turbulent line and point sources of heat.** *U. S. Forest Service. California Forest and Range Experiment Station, Berkeley, Station Paper*, No. 8, Sept. 15, **1954.** 47 p. 4 figs., 17 refs., 54 eqs. **DWB**—An elaborate investigation to develop a theoretical analysis of laminar and turbulent heat sources effecting free convective flow in order to establish an idealized working model of the convective column phenomena during a conflagration such as a forest fire. A steady state with constant combustion rate, potential temperature and other properties, dry air, and neglecting radiant heat transfer, is assumed. Potential temperature does not influence theory when heat output is large, but is important in diffusion mechanism. Conclusion is that laminar heat sources yield narrow convective columns which require large vertical velocities and temperatures. *Subject Headings:* **1. Fire danger due to turbulence 2. Instability effects 3. Convection columns 4. Forest fire control.**—*M.R.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Met. observation station, Antarctica** (Veldkamp), 6.10–22; **Met. obs. at Mt. Cimone** (Fanchiotti), 6.10–24; **History of observatories** (Shcheglov), 6.10–36; **Radiosonde rate of ascent** (Hering), 6.10–76; **Horizontal visibility measurement** (Vassy), 6.10–273.

6.10–60 551.501.1:551.55

Grunow, Johannes, **Repräsentative Zeitabschnitte zur Erfassung der mittleren Windgeschwindigkeit.** [Representative time sections for estimating the mean wind velocity.] *Meteorologische Rundschau*, 8(3/4):57–58, March/April **1955.** 3 figs., 4 refs. **MH-BH**—I.M.O. Resolution 132(1947) lays down that wind force must be measured over a period of 10 min. At Hohenpeissenberg observations were made with a quick-run anemometer to determine errors of shorter periods. The mean scatter about a 10-min. mean of 16 m/s ranged from 22% for $\frac{1}{2}$ min to 2.6% for 5 min interval, extremes 35 and 6%, less for higher speeds. The absolute oscillations were also investigated. Author concludes that the interval of 10 min should not be shortened. An interval of 5 min is tolerable, but anything shorter loses the characteristics of a squally wind. *Subject Heading:* **1. Wind speed estimation.**—*C.E.P.B.*

6.10–61 551.501.4:551.577

*Dugast, G., **Contribution à l'étude du climat d'Alger. Caractères statistiques de la pluie.** [Contribution to the study of the climate of Algiers. Statistical rainfall characteristics.] *Algiers. Université. Institut de Météorologie et de Physique du Globe, Travaux*, [v. 1], No. 10, Oct. **1954.** 36 p. figs., numerous tables, refs. **DWB**—An amazingly thorough analysis of the frequency of rain, rainy days, dry periods and heavy rains at Algiers University for the 25-year period, 1913 to 1937. Graphs, scatter diagrams, tables and discussion bring out the intensity, duration, frequency, extreme values and average daily, 3-day, 10-day, monthly and seasonal as well as actual annual character or variability of the rains in this arid location. Marked singularities appear in the partially smoothed curves, although further smoothing tends to eliminate most irregularities in the annual course. A longer record would also smooth out many of these irregularities. *Subject Headings:* **1. Rainfall frequencies 2. Statistical analysis of rainfall 3. Algiers, Algeria.**—*M.R.*

6.10–62 551.501.4:519.24

Gumbel, Emil J., **Statistical theory of extreme values and some practical applications.** *U. S. National Bureau of Standards, Applied Mathematics*, Ser. 33, Feb. 12, **1954.** 51 p. figs., tables, eqs. **DWB**—A series of 4 lectures given at the U. S. Bureau of Standards is reproduced with all of the pertinent tables, graphs and figures. The theory of extreme values has many applications in meteorology and hydrology as well as other fields. Illustrations of the use of theory in flood design, gust load research, drought, hail, maximum or minimum temperature, pressure, snow, etc. are cited. The fallacy of the 3 σ rule for estimating the practical extreme is brought out by showing that the rule is too strong for small samples and too weak for large. If a great number of items are included in sample, the extreme values may far exceed the 3 σ confidence limit. Many examples are given in tables and graphs from flood frequency and climatological records. *Subject Headings:* **1. Statistical techniques 2. Extreme value theory 3. Flood frequency data.**—*M.R.*

6.10–63 551.501.4:551.577.36

Schneider-Carius, K., **Zur Frage der statistischen Behandlung von Niederschlagsbeobachtungen, Erste Mitt.** [On the statistical treatment of rainfall observations, Pt. 1.] *Zeitschrift für Meteorologie*, 9(5):129–135, May **1955.** 2 tables, 14 refs. **MH-BH**—Approximate and exact logarithmic scales for daily rainfall amounts are set out. Very small amounts are difficult to measure accurately but the distinction between rain and no rain is important. Rainfall frequency and rainfall probability are defined with the example of Berlin. *Subject Headings:* **1. Rainfall frequencies 2. Statistical analysis of rainfall.**—*C.E.P.B.*

6.10–64 551.501.4

Schumann, T. E. W., **The graduation of twelve monthly values of any meteorological element.** *South Africa. Weather Bureau, Notos*, 3(2):104–111, **1954.** 2 figs., 8 tables, ref., 30 eqs. **DWB**—The graduation of twelve monthly data is discussed. By means of a numerical example it is demonstrated that the standard error of a series of data is reduced by applying the proper smoothing formula and that, in this fact, lies the main value of graduation. WHITTAKER's method of graduation, based upon probability theory is applied to a set of twelve data, and numerical tables are presented by means of which the graduation can be performed rapidly to any degree of smoothness desired. It is pointed out that the specific smoothing formula should be selected so that the standard deviation of the graduated from the crude data is equal the standard error of the crude data, and auxiliary tables are provided to facilitate this choice. *Subject Headings:* **1. Data smoothing techniques 2. Computation tables.**—*Author's abstract.*

6.10–65 551.501.6:551.510.52/3

Janz, B., **Tropopause analysis.** *Canada. Meteorological Div., Cir-*2496 TEC-188, June 10, **1954.** 16 p. 20 figs., 23 refs. **DWB**—A consistent analysis of the tropopause can be made using the new W.M.O. definition. Two series of tropopause charts for North America based on the assumption of a continuous tropopause are presented. The first series investigates an autumn situation from Oct. 19th to 29th, 1953; whereas the second series deals with a winter situation from Jan. 18th to 19th, 1954. Some aspects of the theoretical and observational knowledge of the tropopause are discussed with reference to the construction of tropopause charts. *Subject Headings:* **1. Tropopause charts 2. North America.**—*Author's abstract.*

6.10–66 551.501.7:551.510.52/3

§Clarke, R. H., **Effect of the tropopause on thickness patterns used in the construction of high level C.P. charts.** *Australian Meteorological Magazine*, Melbourne, No. 1:16–21, July **1952.** 10 figs., 3 refs. **DWB**—A study of tropopause contours and types over the Australian region and their relation to thickness patterns in the 300–200 and 200–100 mb regions, leads to the construction of a simplified model and several rules for synoptic analysis based on this model and its empirical or statistical applications; charts and graphs illustrate relationship. Conclusion is that if the tropopause is sharply defined, it has a pronounced effect on thickness patterns in layers intersected by the tropopause. Study of these relations is useful in extrapolation. *Subject Headings:* **1. Tropopause analysis 2. Thickness patterns (300–200 mb) 3. Thickness patterns (200–100 mb) 4. Australia.**—*M.R.*

6.10–67 551.501.83:551.594.221

†Chiplonkar, M. W., **The wave-forms of atmospherics.** *Endeavour*, London, 12(48):190–196, Oct. **1953.** 11 figs., 28 refs. **DWB**—Beautiful examples of oscillograph records showing wave forms of various types are included in the form of glossy photograph prints. Atmospherics are defined, their origin briefly discussed, the processes operating when a lightning flash occurs are described and illustrated schematically. Recent discoveries made in Australia, South Africa, India and the United Kingdom regarding the wave form of atmospherics, their explanation, the propagation mechanism and the waveguide-mode theory are outlined in a very lucid manner. *Subject Headings:* **1. Sferics wave forms 2. Sferics research.**—*M.R.*

OBSERVATIONAL DATA

See also: **Insolation, Poland** (Mackiewicz), 6.10–155; **Upper mean flow over N. Atlantic . . .** (Hubert, Dagel), 6.10–193.

6.10–68 551.506.1(71)

*Canada. Meteorological Div., **Annual meteorological summary for Ottawa, Ontario, 1954.** pub. **1955.** 36 p. mostly tables. **DWB**—General notes on history, location of station (since 1938 at Ottawa Airport), surroundings, difference of climate from Toronto and Montreal, instrumentation, summary of weather at Ottawa for year, and for each month,

average and extreme monthly temperature, degree days, humidity (4 times a day), precipitation, snow, sunshine, wind, hydrometeors and pressure; daily maximum, minimum mean temperature, precipitation, snow; comparative data for most elements for 1890–1954; highest maximum each day, lowest minimum, daily mean temperature, monthly and annual maximum minimum and mean temperature, rainfall, snowfall, precipitation (1890–1954); total hours of bright sunshine each month (1898–1954); average wind speed 1939 1954 and degree days 1946 1954. Early records 1890-1938 were made at Dominion Experimental Farm. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Long period records 4. Ottawa, Canada.**—*M.R.*

6.10–69 551.506.1 (058) (431)

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Deutsches Meteorologishes Jahrbuch, 1942, Teil 4, Heft 1, Beobachtungen des Observatoriums Potsdam.** [German meteorological yearbook, 1942, V. 4, Pt. 1, Observations from the Potsdam Observatory.] Berlin, Akademie Verlag, **1954.** 94 p. almost entirely tables. **DWB**—Thrice daily (7, 14 and 21 h) synoptic observations including miscellaneous phenomena, hourly observations (made by recording instruments) of pressure, temperature vapor pressure, relative humidity, wind direction and speed, precipitation and sunshine bi-hourly cloudiness, thrice-daily soil and earth temperature (2, 5, 10, 20, 50, 100, 200, 400 600 and 1200 cm depth); evaporation in mm at 7 h, water content of snow and depth thereof (daily), intensity of direct solar radiation in g cal cm^2/min with yellow and red filter, hourly global and diffuse radiation and hourly heat of radiation; hourly means (for year) of pressure temperature, vapor pressure, relative humidity, wind at 41 m, clouds, precipitation and atmospheric potential (quiet day), soil temperature, total wind movement and wind frequency to 16 directions, amount and duration of precipitation, frequency of precipitation are given. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Meteorology yearbooks 4. Potsdam, Germany.**—*M.R.*

6.10–70 551.506.1 (058) (43)

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Deutsches Meteorologisches Jahrbuch, 1953, Teil 1, Tägliche Beobachtungen.** [German meteorological yearbook, V. 1, Daily observations.] Berlin, Akademie-Verlag, **1954.** 153 p. entirely tables. **DWB**—Contains tabulations of essential data from 4 times daily (1, 7, 13 and 19 h) synoptic observations at 12 stations in East Germany: Arkona, Berlin-Adlershof, Brocken, Erfurt, Fichtelberg, Görlitz, Inselsberg, Leipzig, Neustrelitz, Warnemünde and Wernigerode. Also daily duration of sunshine at 24 stations for each month of 1953 are given. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Meteorological yearbooks 4. East Germany.**—*M.R.*

6.10–71 551.506.1 :551.577.2 (43) (058)

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Deutsches Meteorologisches Jahrbuch, 1953, Teil 3, Niederschlagsbeobachtungen.** [German Meteorological Yearbook, 1953, V. 3, Precipitation observations.] Berlin, Akademie-Verlag, **1954.** 210 p. almost entirely tables, 25 maps in pocket. **DWB**—Daily monthly, and annual total, mean and extreme precipitation, snow, snow depth and other data (storm rainfall, persistent rainfall, % of 40 year normal, etc.) for about 1400 stations in the following regions: Rostock, Schwerin, Neubrandenburg, Potsdam, Frankfurt, Cottbus, Berlin, Magdeburg, Halle, Erfurt, Gera, Suhl, Dresden, Leipzig, and Karl-Marx-Stadt. (Specialized data are given for a selection of stations, only.) *Subject Headings:* **1. Annual precipitation summaries 2. Precipitation data 3. Yearbooks 4. East Germany.**—*M.R.*

6.10–72 551.506.1 (92)

*Indonesia. Djawatan Meteorologi dan Geofisik, **Observations made at secondary stations in Indonesia. V. 26, 1944/1948.** pub. **1954.** 131 p. entirely tables. Continuation of the **Observations made at secondary stations in the Netherlands Indies,** issued by the Netherlands Magnetisch en Meteorologisch Observatorium te Batavia. **DWB**—The last volume of the old series was for 1943 (V. 25; *see* 5B–32, Feb. 1954, *MAB*). During the war

ears observations were irregular, but are published even if incomplete and can be compared vith regular observations of the Central Observatory of Djakarta. The elements tabulated or each hour, 2-hour or 6-hour period of observation for each month of the several years or each station where observations were available are: pressure, temperature, relative humidity, sunshine, rainfall, wind direction frequency and speed, evaporation and cloudiness; all old 20 stations are represented. Means and extreme values are given for each month in most ases. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Indonesia. I. Goenarso, R.** (*comp.*).—*M.R.*

6.10–73 551.506.1(454)(058)

*Modena. Università. Osservatorio Geofisico, **Osservazioni meteorologiche dell'annata 1953.** [Meteorological observations for 1953.] pub. **1954.** 31 p. mostly tables. **DWB**—Complete data summary and month by month descriptive summary of conditions at Modena or year 1953, continuing series for 1892–1937 (1938–1951 was in one volume) and resumed in 1952. The Modena Observatory began observations in 1876. Daily or thrice daily (8 h, 14 h and 19 h), 10-day and monthly values are given for pressure, temperature, wind direction nd speed, sunshine, evaporation, vapor pressure, relative humidity, sky cover, precipitation nd miscellaneous phenomena. (For 1938/1951 issue, *see* 5.4–218, April 1954, *MAB.*) *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Modena, Italy.**—*M.R.*

INSTRUMENT CARRIERS

See also: **Frontier to space** (Burgess), 6.10–5; **V-g records** (Seal, Duncan), 6.10–49; **Airglow measurements with rockets** (Bedinger), 6.10–164; **Sailplane soundings** (Calif. Univ. at L. A.), 6.10–200.

6.10–74 551.507.3

Moore, C. B.; Smith, J. R. and Gaalswyk, A., **Ein neues Hilfsmittel der Wettervorhersage: Ballone, die in einer bestimmten Höhe driften.** [A new aid to forecasting: balloons which drift at a definite height.] *Umschau*, 55(9):261–262, May 1, **1955. DLC**—Summary of their paper **On the use of constant-level balloons to measure horizontal motions in the atmosphere** in *Journal of Meteorology*, 11(3):167–172, June **1954** (*see item* 6.2–118, Feb. 1955, *MAB*). An account of the polyethylene constant height balloons and their use in checking trajectories calculated from weather charts. *Subject Heading:* **1. Constant level balloons.**—*C.E.P.B.*

6.10–75 551.507.321:546.11

Canada. Meteorological Div., **Safety measures in connection with storing and handling of hydrogen.** Its *CIR*-2343, INS-51, Aug. 12, **1953.** 2 p. **DWB**—A letter requesting strict observance of instructions concerning the safe storing and handling of hydrogen outlined in *Circular* No. 902 especially in connection with the filling of balloons. *Subject Headings:* **1. Hydrogen storage 2. Balloon inflation.**—*A.M.P.*

6.10–76 551.507.321.2:551.501.7:551.508.822

Hering, W., **Verfahren zur Bestimmung der Aufstiegsgeschwindigkeiten der Radiosonde—Modell Lang.** [Determination of the velocity of ascent of the Lange radiosonde.] *Zeitschrift für Meteorologie*, 9(5):153–155, May **1955.** 3 figs., 5 eqs. **MH-BH**—A method is described for determining the velocity of ascent from the pressure-height and pressure-time curves. A linear scale is illustrated, with instructions for use. *Subject Headings:* **1. Radiosonde rate of ascent 2. Lange radiosonde.**—*C.E.P.B.*

INSTRUMENTS

See also: **Radiosonde rate of ascent** (Hering), 6.10–76; **Evaporation, S. Calif.** (Young), 6.10–209.

6.10–77 551.508.21

Georgi, Johannes, **Kleines Absolut-Pyrheliometer.** [Small absolute pyrheliometers.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst,*

Veröffentlichung, No. 14, **1954.** 82 p. 15 figs. (incl. photos), 2 tables (1 fold.), bibliogs p. 73–74, 80–81, eqs. **DWB**—The contents of this monograph on the small absolut pyrheliometer, both of its first and second models are as follows: brief survey of the mos commonly used pyrheliometers (K. ÅNGSTRÖM's electric compensation pyrheliometer an ABBOT's pyrheliometer), the calorimetry principle in the measurement of radiation, the self calibrating small pyrheliometer Model I, 1940/50 with 5 hg shield, the use of a thermally iner measuring unit, the improved Model II of 1950–51 with thermos flask, heat flow in the measur ing unit and the expected course of heating and cooling of the measuring unit, results of actua measurements, the improvement of accuracy with a chronograph, the additional instrumenta tion, calculation of measurements, etc. Discussion on the evaluation of the cooling curv and numerical tables for evaluating the radiation measurements are included. *Subject Head ings:* **1. Pyrheliometers 2. Radiation measurement.**—*I.L.D.*

6.10–78 551.508.2

†*Thams, J. C., **Erfahrungen mit einem neuen Ueberzug der Lamellen des bimetallaktino graphen Fuess-Robitzsh.** [Experiments with a new coat of paint on the plates of the Fuess Robitzsch bimetal actinograph.] *Geofisica Pura e Applicata*, 24:115–124, Jan./April **1953** 3 figs., 5 tables, 9 refs. English summary p. 115. **DWB**—A Fuess-Robitzsch actinometer pu into use at Locarno-Monti in 1938 began to lose its sensitivity after 2 or 3 years so that in th period 1940 to 1943 the instrument showed a decline of 20% in the recorded values during th summer. The white plates became gray and the paint cracked so the contrast was much poore than at the time of calibration. Tests made in 1946–47 showed that it was impossible t determine whether the loss of sensitivity was due to changes in the optical or in the flexibilit factor. However a new coat of paint was put on the plates and subsequent tests (during th period 1946–52) showed that the calibration factor remained constant for at least 5 years the calibration factor (K) depends on the sun's height and on the air temperature. Table show the values of K for each year for various solar angles and temperatures for 1946–195 for the instrument tested at Locarno-Monti; a diurnal and seasonal correction factor can b calculated and applied to actinograph records. *Subject Headings:* **1. Fuess-Robitzsch actino graph 2. Actinograph corrections 3. Actinometer calibration 4. Locarno-Monti, Switzer land.**—*M.R.*

6.10–79 551.508.25:551.521.

Cooper, E. R. and Probine, M. C., **Spectrophotometry of radiation from sun and sky** *Illuminating Engineering Society of London, Transactions*, 19(1):8–20, **1954.** 9 figs., 2 tables 11 refs., 9 eqs. Also: Hull, J. N., **Spectral distribution of radiation from sun and sky.** *Ibid.* p. 21–28. 9 figs., 2 tables, 2 refs. **DBS**—COOPER and PROBINE describe a spectrophotometer which measures the spectral distribution of radiation from sun and sky, or sky alone, falling o a horizontal surface through an annular opening at top of a sphere coated inside with magnesium oxide. Optical system (illustrated) includes a Hilger constant-deviation spectrometer, photo multiplier, auxiliary collimator and compensation for fatigue. HULL summarizes observation with this instrument near Wellington, N. Z. Distribution on overcast days was similar t clear days but total was only about 1/5. In haze, thin cloud and mist relative energy wa higher above 6.4μ. Radiation from sky alone showed relative predominance below 0.52μ especially on clear days. A simplified method of representing distribution by color temperatur is described. *Subject Headings:* **1. Spectrophotometers 2. Global radiation.**—*C.E.P.B.*

6.10–80 551.508.43 551.54

†Teichert, F. and Kohn, U. (*Met. Observatory, Dresden-Wahnsdorf, Germany*), **Ein Mikro variograph zur Registrierung kurzperiodischer Luftdruckschwankungen.** [A microvariograph for recording short period atmospheric pressure variations.] *Zeitschrift für Meteorologie* 8(5):132–142, May **1954.** 11 figs., 34 refs. **MH-BH**—The literature (since 1912) on th measurement of small atmospheric pressure variations is reviewed. The construction calibration and installation of the microvariograph are described with the aid of diagram and photographs. The apparatus is capable of recording barometric variations with a mag nitude of 1 Hz and operates according to mathematical principles. The recording is photo graphic. The microbarographic behavior of the atmosphere was characterized by frequencie

f 3 and 1/12 Hz. The frequency 1 Hz was recorded under all weather conditions. The scillation of 1/10–1/12 Hz occurs with higher amplitudes than the short period oscillations. Depending upon weather condition oscillation of 2, 3, as well as between 1 and 1/10 Hz were ecorded. *Subject Headings:* **1. Microbarographs 2. Pressure microvariations.**—*I.L.D.*

6.10–81 551.508.49

†Benioff, Hugo (*Calif. Inst. of Tech.*), **Earthquake seismographs and associated instruments.** *Advances in Geophysics*, ed. by H. E. Landsberg, 2:219–275, **1955.** 47 figs. (incl. photos.), 7 refs., 22 eqs. **DLC**—Torsion, pendulum, electromagnetic pendulum (moving-conductor nd variable reluctance), electrostatic transducer pendulum, carrier current transducer, eismographs; linear strain seismographs and remote recording seismographs; components nd response characteristics are reviewed in a systematic manner, illustrated and well an- otated. Pressure fluctuations can be recorded on sensitive seismographs, and on the other and pressure variation cause disturbances which alter normal seismographic records and alculations (p. 269–274). Microseismic records with variable reluctance emission pendulum eismograph are discussed on p. 228–229. *Subject Headings:* **1. Seismographs 2. Pressure ffects on seismic records 3. Microseism recorders.**—*M.R.*

6.10–82 551.508.51

Sanuki, M. (*Central Met. Observ., Tokyo*) and Kimura, S. (*Met. Res. Inst., Tokyo*), **Experi- ients on a cup-anemometer in pitching and rolling motion.** *Papers in Meteorology and Geo- hysics*, Tokyo, 5(3/4):233–235, Jan. **1955.** 5 figs., ref. **DWB**—A cup-anemometer model is scillated in the current of wind tunnel to simulate ship installation in pitching and rolling notion. The mean rotational speed of the anemometer is found larger by a certain amount uring the oscillation than in the steady case. This result is contrary to the case of com- ination anemometer and wind vane, where a certain underspeed is observed in its mean value. *ubject Heading:* **1. Anemometers.**—*Author's abstract.*

6.10–83 551.508.53

Höhne, Werner, **Windrichtungsschreiber für schwache Luftströmungen.** [Wind direction ecorder for weak air currents.] *Zeitschrift für Meteorologie*, 9(5):135–143, May **1955.** 6 figs., refs. **MH-BH**—The recorder includes a heating element and a thermopile. The junctions re so arranged that a change of wind direction introduces a thermocouple, the sign of which epends on the sense of rotation of the wind. The thermal current is connected to a photo- lectric galvanometer relay, which switches on a motor and turns the instrument until the hermocouple becomes zero. Specimen records in a closed room are shown. *Subject Headings:* **. Electromechanical anemometers 2. Wind direction recorders.**—*C.E.P.B.*

6.10–84 551.508.77

*Mercanton, P.-L., **Recherches de technique pluviométrique, X.** [Research on methods f pluviometry, Pt. 10.] *Switzerland. Meteorologische Zentralanstalt, Annalen*, v. 90, 1953, ub. **1954.** (9 p. following Anhang No. 7.) 6 figs., 5 tables. **DWB**—An experimental ieteorological station was set up at Sentier in 1941 to test 6 types of rain or snow gage. The esults up to 1952 are tabulated. The gages were: 1) Hellmann (unshielded), 2) Hellmann with hield, 3) Maurer and Billwiller (MZA) totaliser and 4) same with shield, 5) Ellipsoidal and) Hellmann at Collège de Chenit (1020 m). The precipitation at the last named place xceeded by 4.5% that of the Hellmann gage in the field and by 9% the average of all gages or the 10 years. *Subject Headings:* **1. Rain gage comparison 2. Sentier, Switzerland.**—*M.R.*

6.10–85 551.508.822

Bohnenblust, Max, **Un nouveau récepteur multiple pour l'étalonnage de la radiosonde uisse.** [New multiple receiver for calibrating the Swiss radiosonde.] *Switzerland. Me- orologische Zentralanstalt, Annalen*, V. 90, 1953, pub. **1954.** (3 p. following Anhang No. 7.) iagrs., photos, 3 refs. **DWB**—The 400 Mc receiver used in calibrating radiosondes in Switzer- nd is described and illustrated photographically and with line drawings. Both the outside nd inside (2 views) are shown in large photographs. By using 4 frequencies near 400 Mc 405, 400, 395 and 390 Mc) for the 4 elements to be transmitted, parasitic effects of the 3

inactive transmitters are reduced to a minimum. *Subject Headings:* **1. Radiosonde calibratio receiver 2. Swiss radiosonde 3. Switzerland.**—*M.R.*

6.10–86 551.508.822:551.594.1

*Coroniti, S. C.; Nazarek, A.; Stergis, C. G. et al., **Balloon borne conductivity meter** *U. S. Air Force. Cambridge Research Center, Instrumentation for Geophysical Research*, No. 3 Dec. **1954.** 9 +p. 9 figs. (incl. photos), 3 tables, 10 refs. **DWB**—A radiosonde for measurin atmospheric conductivity up to 70,000 ft is described and illustrated in detail, and results o measurements of conductivity are tabulated, and a record made at Holloman Air Force Base Almogordo, N. Mexico, is reproduced. Conductivity decreased to 70,000 ft. The tempera ture, pressure and conductivity are telemetered to a 6 MD-IA radiosonde receiver on th ground. The conductivity is measured by a modified Gerdien chamber with a DC electromete amplifier to activate the radiosonde transmitter. Results of airplane and balloon sounding by others are compared with current method. *Subject Headings:* **1. Conductivity meter 2. Radiosondes 3. Almogordo, N. Mexico. I. Kotas, D. E. II. Seymour, D. W. III. Werme J. V.**—*M.R.*

6.10–87 551.508.95

Busse, W., **Über eine handliche und hinreichend genaue kolorimetrische Methode fü Ozonmessungen.** [On a handy and sufficiently exact colorimetric method for ozone measure ments.] *Meteorologische Rundschau*, 7(1/2):14–15, Jan./Feb. **1954.** 3 refs. **DWB**—Th method consists of placing 3 cc 2% potassium iodide solution in a tube with 2–3 drops o starch solution and slowly passing 20–30 m^3 air through. The solution is then drawn int a glass tube of 5 mm diameter and the color compared with a similar tube of distilled wate A solution of $Na_2S_2O_3$ is added until the color disappears and the quantity necessary give the ozone content. *Subject Heading:* **1. Ozone measurement techniques.**—*C.E.P.B.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Objective weather forecasting** (Gringorten), 6.10–12; **Arctic forecasting** (U. S. Off. Naval Operations), 6.10–13; **Synoptic met.** (Tannehill), 6.10-14; **Marine navigation** (Rodewald), 6.10-38; **Weather works for women**, 6.10–53; **Transfer of angular momentum in atmos.** (Kubota, Iida), 6.10-134; **Snow cover importance** (Rikhter), 6.10-236; **Snow survey bulletin, Brit. Columbia**, 6.10–239; *also* special bibliography on *Weather Modification*, p. 1433.

6.10–88 551.509:551.51

Wahl, Eberhard W., **Das statistische Entropieverhältnis, ein Hilfsmittel zur Lösung vo Vorhersageproblemen.** [The statistical entropy relation, an aid in the solution of forecasting problems.] *Meteorologische Rundschau*, 8(3/4):51–54, March/April **1955.** 6 refs. **MH-BH**— Objective weather forecasts are often overlain by detail which makes evaluation of thei success difficult. The work of American authors on this problem is discussed. Entropy expressed as the percentage decrease of the original amount, is adopted as the "Informatio index." Examples of its calculation are given, showing how it can be used to select the "bes predictor." *Subject Headings:* **1. Entropy 2. Objective weather forecasting.**—*C.E.P.B.*

6.10–89 551.509.2

*Pakistan. Regional Meteorological Centre, Karachi, **Regional daily weather repor for Sind, Baluchistan and Persian Gulf.** First issue seen, Aug. 19, 1954— Latest issue seen Jan. 10, 1955. 1 p. each. tables. Mimeo. At head of recent pieces: Regd. No. S-990 **DWB**—This daily report gives brief weather summary and forecasts for various regions in the Persian Gulf area, and surface and upper air data for Karachi, Karachi Airport, 14 stations in Baluchistan, 9 stations in Sind, 4 on the Persian Gulf and Oman, 3 in West Pakistan and 4 in India. Data include pressure, temperature, relative humidity, rainfall for day, month and agricultural year, and anomalies of temperature, relative humidity and rainfall. Upper air winds, temperature and relative humidity are given for 5000, 10,000 and 15,000 ft. *Subject Headings:* **1. Daily weather reports 2. West Pakistan 3. Persian Gulf.**—*M.R.*

6.10–90 551.509.2:654.17

Sutton, O. G., **Weather forecasts on television.** *Meteorological Magazine*, London, 83(981):65–66, March 1954. **MH-BH**—Brief account by the Director of the Meteorological Office of the personal approach in televised B.B.C. forecasts initiated on Jan. 11, 1954. *Subject Headings:* **1. Television weather broadcasts 2. Prognostic charts.**—*C.E.P.B.*

6.10–91 551.509.21:621.397

Farquharson, J. S., **Weather wisdom by television.** *Meteorological Magazine*, London, 83(983):130–133, May **1954. DWB** Account of recent changes by which a forecaster presents and describes personally two charts, actual for 1500 h of the day in question and preparatic for noon of the following day. *Subject Heading:* **1. Television weather broadcasts.**—*C.E.P.B.*

6.10–92 551.509.25

Duvedal, T. (*Met. and Hydrological Inst., Sweden*), **A quantitative prognostic method for thickness charts using advective tendencies.** *Tellus*, 6(2):192–197, May **1954.** 5 figs., table, 5 refs., 4 eqs. **MH-BH**—A method is presented for the use of upper winds to construct a chart for the horizontal distribution of advective tendencies in the layer 1000–500 mb. A 24-hr prognostic thickness chart can then be constructed from these advective tendencies. The method has been tested in a few weather situations in Europe, especially the one of Jan. 30–Feb. 2, 1953. *Subject Headings:* **1. Prognostic chart preparation 2. Thickness charts (500–1000 mb).**—*Author's abstract.*

6.10–93 551.509.3

Kubota, S. (*Met. Res. Inst., Tokyo*), **Preliminary investigations for prediction of the height change of 500-mb level over the Northern Hemisphere.** *Papers in Meteorology and Geophysics*, Tokyo, 5(3/4):217–223, Jan. **1955.** 2 figs., 4 tables, 4 refs., 6 eqs. **DWB**—The effect of topography and influences of the vorticity flow near 35°N lat. on the height change of isobaric surface along 50°N lat. circle are discussed, which are, among others, necessary for the prediction of the height change of 500-mb surface over the Northern Hemisphere by harmonic coefficients computed along every latitude circle. It was found 1) that topography has a considerable effect in low latitudes, but, on the whole, little in our case, and 2) that we must take the area from the pole to 20°N lat. at least as a prediction area. *Subject Headings:* **1. Forecasting height change of 500 mb level 2. Northern Hemisphere.**—*Author's abstract.*

6.10–94 551.509.3:551.515.1(265)

Nagayama, Moriyoshi, **On the forecasting of the rate of development of cyclones generated in the southern part of East China Sea in winter.** *Oceanography and Meteorology*, Nagasaki, 1(2/4):119–122, Dec. **1954.** 5 figs., 5 refs. In Japanese; English summary p. 146. **MH-BH**—A high correlation is found to exist between the rate of the development of cyclones (*R*) forming in the southern part of East China Sea in winter and the conduction of sensible heat (*Qh*) or the total energy exchanged between sea and atmosphere (*Qa*), and it is shown that *R* may be forecast to some extent by calculating *Qh* or *Qa* using data at Nase in the Ryukyu Islands, from the day when a NW monsoon begins to blow to the previous day of the cyclone formation in the southern part of East China Sea. *Subject Headings:* **1. Cyclogenesis forecasting 2. Energy exchange ocean-atmosphere 3. East China Sea.**—*Author's abstract.*

6.10–95 551.509.3:519.283

Ogawara, M. (*Met. Res. Inst., Tokyo*), **Efficiency of a stochastic prediction.** *Papers in Meteorology and Geophysics*, Tokyo, 5(3/4):203–212, Jan. **1955.** 2 tables, 2 refs., 17 eqs. **DWB**—An idea of efficiency of a prediction is introduced that is defined on the conception of risk function in which the effect of a prediction to the human behavior or the social activity and the protection cost are considered. How to use the stochastic prediction introduced by the author is explained by the risk function and, from a view point of the efficiency, it is shown that the stochastic prediction is the most reasonable one. The calculation method of efficiency is explained by two examples. *Subject Headings:* **1. Statistical forecasting 2. Weather forecasting.**—*Author's abstract.*

6.10–96 551.509.

Ogawara, M. et al., **Forecasting by small sample.** *Journal of Meteorological Researc* Tokyo, 6(6):172–183, July **1954.** 3 figs., 3 tables, 4 refs., eqs. In Japanese; English summar p. 172. **MH-BH**—The first step of weather forecasting should consist of detailed classificatio of the data according to the physical or statistical conditions which control deterministicall the future state. Consequently it is inevitable, from a statistical stand point, to treat a sma sample. We prepared a forecasting formula based on an exact sampling theory of time serie which is derived from the application of regression theory and rejection limits theory. theory of testing correlogram for an autoregressive process which forms a part of our forecastin scheme was developed on the same idea. According to the forecasting scheme, we tried t forecast the daily pressure at Ōsaka in which detailed calculation methods were illustrated *Subject Headings:* **1. Weather forecasting 2. Statistical forecasting.**—*Authors' abstract.*

6.10–97 551.509.3:519.28

Ogawara, M. (*Met. Res. Inst., Tokyo*), **A general stochastic prediction formula.** *Paper in Meteorology and Geophysics*, Tokyo, 5(3/4):193–203, Jan. **1955.** 12 refs., 27 eqs. **DWB**— In this report a statistical theory of prediction that can be applied to the forecasting based o limited data or a small sample is outlined. The exact sampling prediction theory is frame on two foundation stones; the one is a two sample theory in which the multivariate regressio theory is introduced, and the other of time series in which a sort of conditional independenc is introduced for some types of processes that may be sufficiently general for practice. Fro the fundamental theory some special prediction formulas are derived; for instance, the join prediction of future changes, the prediction of the pattern of distribution of a meteorologica element and so forth. In order to express the uncertainty of a prediction an idea of stochasti prediction is introduced, which is defined by a sort of relative conditional probability dis tribution. *Subject Headings:* **1. Statistical forecasting 2. Weather forecasting.**—*Author' abstract.*

6.10–98 551.509.3

Schwerdtfeger, Werner, **Verbesserung der Wettervorhersage—durch numerische un durch statistische Methoden.** [Improving weather forecasts by numerical and by statistica methods.] *Meteorologische Rundschau*, 8(3/4):59–60, March/April **1955.** 6 refs. **MH-BH**— Argues that a combination of statistical and numerical forecasting might improve *weathe* forecasts. Statistical methods can give confidence limits, e.g., by multiple correlation, improv short range local forecasts, etc. A systematic investigation is called for. *Subject Heading* **1. Weather forecasting.**—*C.E.P.B.*

6.10–99 551.509.31

Hollmann, G., **Eine neue Methode zur approximativen Lösung barokliner Prognose probleme.** [A new method of approximate solution of baroclinic forecasting problems. *Meteorologische Rundschau*, 8(3/4):42–44, March/April **1955.** 28 eqs. **MH-BH**—A ne method for the solution of baroclinic forecasting problems is described, which is equivalen to a complete approximate integration of the fundamental hydro-thermodynamic equation To exclude meteorological disturbance phenomena, a secondary condition is the vanishing the mean divergence of the horizontal flow over the whole air column. With the help of th rotation and divergence equation, and a thermodynamic equation, derived from the equation of motion, the strict integration is effected by representing the velocity by a rotation an divergence potential by quadrature and solutions of two-dimensional Poisson equation *Subject Heading:* **1. Numerical forecasting techniques.**—*Transl. of author's abstract.*

6.10–100 551.509.31

Wippermann, F., **Über das Verhalten des Truncationsfehlers bei Verwendung de zweidimensionalen und divergenzfreien Vorticity-Differenzengleichung.** [On the truncatio error in the application of the two-dimensional nondivergent vorticity difference equation. *Meteorologische Rundschau*, 8(3/4):44–48, March/April **1955.** fig., 4 tables, 6 refs., 36 eq **MH-BH**—For the linearized as for the non-linear two-dimensional divergence-free vorticit equation in difference form, in certain circumstances the solution and criteria for stable erro

onvergence are given. By comparison of these solutions with those for the corresponding ifferential equations it is seen that in the region of stable error convergence the truncation error nly changes the phase velocity of the waves. This is increased by the error of truncation in me, decreased by truncation in space. Thus for every space-mesh Δx an optimal time-step Δt an be found, for which these two effects cancel and the truncation error vanishes. When ie instability threshold is reached the phase velocity remains constant but the amplitude egins to grow. An example makes this clear. *Subject Heading:* **1. Numerical forecasting echniques.**—*Transl. of author's abstract.*

6.10–101 551.509.5 551.578.45:551.524.36

§Scherhag, R., **Aktuelle Probleme des modernen Wetterdienstes.** [Current problems of ie modern weather service.] *Berlin. Freie Universität, Institut für Meteorologie und Geo-hysik, Meteorologische Abhandlungen*, 2(3):83–90, **1954. DWB**—The author discusses the ide scope of modern weather forecasting services which must predict the small violent storms hich affect only a limited area, and large cyclones covering half a continent or ocean, and onditions from the street or vineyard level to 20 km elevation. As one example, the origin the Netherlands storm of Feb. 1, 1955 is analyzed synoptically with special reference to the ath of cold poles of which two to three are in the Northern Hemisphere with centers in Canada nd Northern Siberia. *Subject Headings:* **1. Cold poles 2. Snowstorms, Netherlands Feb. 955) 3. Synoptic analysis 4. Netherlands.**—*I.L.D., M.R.*

6.10–102 551.509.52:551.557:629.13

Durst, C. S., **The accuracy of route wind forecasts for aviation.** *Institute of Navigation, ondon, Journal*, 7(1):28–43, Jan. **1954.** 4 figs., 10 tables, 4 refs., 5 eqs. Discussion p. 43–48. **LC**—Accuracy of forecasts of wind at 40,000 ft between London and Rome is discussed. rrors are proportional to time lag between observations and forecast and to S.D. of winds t a point or along route. Errors in estimates of actual equivalent head winds from charts ave a S.D. of 7.5 kt, forecasts differ from chart winds by 11 kt. Errors of forecasts over other outes with fewer or no data, and "forecasts" based on persistence of existing conditions are so considered. Suggestions are made on best distribution of observing stations and on chnique of using wind forecasts in conjunction with homing aids. Appendices discuss error wind estimates by two estimators and estimation of future route winds from actual observa-ons at certain points. *Subject Headings:* **1. Upper wind forecasting 2. Airways forecasting London–Rome air route.**—*C.E.P.B.*

6.10–103 551.509.52:629.13

Hall, Clifford D., **Forecasting the lake breeze and its effects on visibility at Chicago lidway Airport.** *American Meteorological Society, Bulletin*, 35(3):105–111, March **1954.** figs., 8 refs. **MH-BH**—As a rule the lake breeze extends only a mile or so inland from Lake lichigan, but 3 or 4 times a month (in the warm months) the breeze reaches Chicago Airport, mi inland, bringing smoke and poor visibility. To forecast this, summer pressures and other onditions were studied for 1946, 1947 and 1948. It was found that tight or cyclonic gradients e unfavorable for such lake breeze penetration, but flat areas of high pressure with a ridge ie near Chicago are ideal. The pressure gradient (in the middle of the day) from the cold ke to warm land, distorts the normal weak gradient which assists the cold air advection. specific objective time forecast chart, based on 0630C pressure differences between Chicago, lilwaukee and Muskegon, and other more subjective tests are suggested as modifications of ie above system. Independent data (for 1949) gave >80% success. *Subject Headings:* **Lake breeze forecasting 2. Objective forecasting 3. Chicago Midway Airport.**—*M.R.*

6.10–104 551.509.52:551.55

*Wentink, Francis C., **Climatological evaluation of surface winds at the Naval Ordnance est Station for forecasting and planning purposes.** *U. S. Naval Ordnance Test Station, yokern, NOTS TM*, No. 1772, May 1, **1954.** 5 p. numerous graphs. **DWB**—In order forecast more accurately surface wind direction and speed, the winds recorded at the station er a period of eight years were studied. Two approaches were used: one divided the data cording to the forecasting periods used most frequently; the other considered the wind

parameters on an hourly basis. Five groups of graphs with twelve charts to each group for each month of the year were compiled. The first two group data as collected for the forecasting period 0600–1200, 1200–1800 and 1800–0600; the third set presents various velocity parameters developed on an hourly basis; the fourth group "makes a comparison of the various percentages of wind velocity for ready reference in determining time of day certain wind velocities are likely to occur," and the fifth group presents the same treatment for wind direction. *Subject Headings:* **1. Surface wind forecasting 2. Surface wind data 3. Wind velocity data 4. Inyokern, Calif.**—*I.L.D.*

6.10–105 551.509.531:634

Krick, Irving P., **Spring frost forecast.** *American Fruit Grower*, Willoughby, Ohio 74(2):22–23, Feb. **1954.** 4 charts. **DWB**—In 1953 spring fruit buds and flowers were about a month ahead of normal over most of the U.S.A. Normal spring development is predicted for the West in 1954, but in the East temperatures are predicted to be milder than usual and moisture above average into June. Chart of U. S. shows predicted last date of frost compared to normal expectancy lines for southern limit of frost in mid-Feb., mid-March, mid-April, mid-May and early June. In the West late frost will be counterbalanced by late development in the East and Great Lakes, an early season will give good fruit prospects too. *Subject Headings:* **1. Frost forecasts for fruit growers 2. Seasonal forecasts 3. United States.**—*M.R.*

6.10–106 551.509.54

§Kurashige, Kazuhiko, **Practical method of snow accretion forecast.** *Researches on Snow and Ice*, Tokyo, No. 1:86–92, Oct. **1953.** 11 figs., 2 tables. In Japanese. **DWB**—Involves elaborate synoptic and statistical methods. Charts and scatter diagrams are presented. *Subject Headings:* **1. Objective forecasting 2. Snow depth forecasting.**—*M.R.*

6.10–107 551.509.54

Laird, Harley B. and Dickey, Woodrow W. (*U. S. W. B., Denver*), **Forecasting rain-or-snow at Denver, Colorado, September–November.** *American Meteorological Society, Bulletin* 34(7):287–292, Sept. **1953.** 5 figs., 3 tables, 3 refs. **MH-BH**—The authors devised a technique whereby it would be possible to determine from a perfect precipitation forecast for the period 14 to 26 hours beyond forecast time whether the expected precipitation will be rain or snow (with special reference to Denver, Colorado during the interval Sept.–Nov.). The precipitation period was divided into 12 hr periods and each was associated with the 700 mb chart 21½ hours before the beginning of the first precipitation period. A difference chart was made to bring out the major areas of difference in flow patterns and temperature distribution and six variables representing the major differences in height, height gradients, temperature and temperature gradients were chosen and these variables were applied to the other periods of precipitation. The results of this study show an over all separation of 95% and a skill score of 90%. *Subject Headings:* **1. Precipitation forecasting 2. Short range forecasting 3. Denver, Colo.**—*I.L.D.*

6.10–108 551.509.58:551.579.4

†American Society of Civil Engineers. New York. Joint Division Committee on Floods. **Review of flood frequency methods. Final report of the Subcommittee.** *American Society of Civil Engineers, Proceedings*, Vol. 77, Separate No. 110, Dec. **1951.** 11 p. fig., table, 2½ foot-refs. Price: $.50. **DWB**—Current methods of predicting flood frequencies are analyzed as to their principles, methods, validity and errors. Major attention is given to the establishment of flood frequency curves from available records with correction for historic floods, changing conditions in watershed, etc. The method of calculating maximum possible flood by applying the unit hydrograph to the maximum possible precipitation is discussed. The committee concludes that available methods, which are solely based on extrapolations of frequency plotting of existing flood records, while suitable for use in connection with minor structures, "are to be condemned for the determination of probable frequency of floods for which major structures should be designed, the failure of which would result in a calamity." *Subject Headings:* **1. Flood frequencies 2. Flood forecasting.**—*G.T.*

6.10–109 551.509.8:551.521.31

Schulz, L., **Zu dem alten Sprichwort: Die Sonne sticht, es wird bald regnen!** [On the d proverb: the sun bites, it will soon rain.] *Meteorologische Rundschau*, 8(3/4):67, March/ pril **1955.** fig. **MH-BH**—On many days the global radiation is exceptionally high for ıort periods. An example is given when such periods were followed by showers. It is due) "focusing" of the sun's rays by reflection from the sides of narrow gaps in tall Cu (shower) ouds. *Subject Headings:* **1. Solar radiation 2. Weather lore.**—*C.E.P.B.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

STRUCTURE OF THE ATMOSPHERE

6.10–110 551.510.41:06

Eriksson, E. (*Univ. of Stockholm, Inst. of Met.*), **Report on informal conference in at- ıospheric chemistry held at the Meteorological Institute, University of Stockholm, May 24–26, 954.** *Tellus*, 6(3):302–307, Aug. **1954. MH-BH**—A preliminary conference on cloud physics nd atmospheric circulation in relation to atmospheric chemistry was held at the Institute of Ieteorology in Stockholm in Oct. 1952. At the second conference on May 24–26, 1954 the rogress and present status of knowledge of atmospheric chemistry in relation to synoptic onditions was reviewed, and plans formulated for a cooperative world-wide program of esearch and observation in this field. Two subjects are discussed at length: (1) atmospheric CO_2 cycle, and (2) composition of atmospheric precipitation; projects were worked out for oth. *Subject Headings:* **1. Atmospheric chemistry conferences 2. Carbon dioxide cycle . Stockholm. Univ. Meteorological Institute.**—*M.R.*

6.10–111 551.510.41:551.577

Rossby, C.-G. (*Stockholm Univ.*) and Egnér, H. (*Roy. Agric. Coll., Uppsala*), **On the hemical climate and its variation with the atmospheric circulation pattern.** *Tellus*, Stock- olm, 7(1):118–133, Feb. **1955.** 16 figs., table, 16 refs. **DLC**—A study of the chemical omposition of monthly precipitation samples from a number of stations in Sweden brings out he existence of significant variations in the relative proportions of chlorides and sodium epending upon the general character of the prevailing circulation. In maritime westerly ows the weight ratio of chloride to sodium decreases eastward to values which lie far below he value characteristic of sea water. In precipitation falling from arctic or polar continental ir masses the chloride component is almost completely absent. The highest amounts of hlorides relative to sodium are observed in precipitation from warm and moist air masses eaching Sweden from the south or southeast. Significant variations are observed also in the early means of the sodium and sulphur deposits depending upon the dominance of maritime r continental air currents. A sketch map of the "average" chloride concentration in European recipitation prepared from miscellaneous older data lends support to the results of the analysis f the monthly data. The separation of the chemical components indicated by this study ould seem to be of considerable geochemical interest since it would permit different maritime alts to be deposited in widely separated parts of the continents. It is not inconceivable that detailed study of the association between different circulation patterns and the corresponding hemical climates might permit us to draw inferences concerning variations in the atmospheric irculation during post-glacial times, e.g., from the data on the chemical stratification in raised ogs now becoming available through the investigations by Mattson and Koutler-Anders- on. *Subject Headings:* **1. Chemical composition of rain 2. Chemical composition of the tmosphere 3. Air mass climatology 4. Chemical climatology.**—*Authors' abstract.*

ATMOSPHERIC POLLUTION

See also: **London fog** (Dukhanina), 6.10–218.

6.10–112 551.510.42:546.811

Jecklin, L., **Bleistaub in der Luft.** [Lead dust in the air.] *Leben und Umwelt*, Basel, 1(10/11):234–235, July/Aug. **1955.** 2 figs. **DWB**—In Switzerland at least 165,000 kg of

fine lead dust is puffed into the air by benzine motors. To determine whether this is retained in the lungs, author tested inspired and expired air in a printing works. All the lead dust was retained in the lungs. *Subject Headings:* **1. Atmospheric pollutants 2. Lead dust.**—*C.E.P.B.*

6.10–113 551.510.42

Shvarts, IA. I.; Berezman, R. I. and Zil'berg, L. A., **K voprosu ob opredelenii sazhi v atmosfernom vozdukhe Rigi.** [On the determination of soot in the atmosphere of Riga.] *Gigiena i Sanitariia*, Moscow, 12:14–18, Dec. **1954.** 2 figs., 3 tables, 2 refs. **DLC**—A method for the differential determination of soot dust and solid contaminants without additional filtering of air is described. The collection of soot with chloroform diminishes the side effects of dust upon the calometric determination of soot. Data are given on the dust and soot content of the industrial zones of Riga. *Subject Headings:* **1. Atmospheric pollution 2. Soot falls 3. Industrial meteorology 4. Air sampling and analysis 5. Riga, Latvia.**—*I.L.D.*

6.10–114 551.510.42:628.53:546.22

Smoke and sulphur: attacks on smokeless fuels. *Smokeless Air*, 94:212–215, Summer **1955. DWB**—Arguments that the real danger of smog is the emission of sulphur gases, which is not lessened by the use of smokeless fuels, are countered. Soot particles, by condensing water droplets, form drops of sulphurous and sulphuric acid, and by intercepting sunlight lower the temperature and raise the humidity. Also in place of open fires more efficient combustion, use of electricity, etc. will reduce amount of sulphur emitted. *Subject Headings:* **1. Atmospheric pollution 2. Sulfur content of air.**—*C.E.P.B.*

6.10–115 551.510.42:614.7

Turner, W. C., **Atmospheric pollution.** *Weather*, 10(4):110–119, April **1955. DWB**—The history of pollution in Britain is summarized. The evil effects of various chemicals such as hydrofluoric acid are described and then the effects of combustion of coal are taken up. The physiology of breathing and the removal of smoke particles is described and the effects of carbon monoxide are considered. *Subject Heading:* **1. Atmospheric pollution effects.**—*C.E.P.B.*

UPPER ATMOSPHERE—IONOSPHERE

See also: **Frontier to space** (Burgess), 6.10–5; **Upper atmos.**, 6.10–17; **Tropopause analysis** (Janz), 6.10–65; **Tropopause effect** (Clarke), 6.10–66; **Ionospheric variations, Saskatoon** (Meek), 6.10–288.

6.10–116 551.510.5:001

Bontrond, E., **Les grandes divisions dans la structure verticale de l'atmosphère.** [Major divisions in the vertical structure of the atmosphere.] *La Météorologie*, 4th Ser., No. 35:249–252, July/Sept. **1954.** fig. French, English and Italian summaries p. 249. **DWB**—The present article briefly outlines the principal view points on study of the vertical structure of the atmosphere and gives the terminology recommended for designation of the large divisions recognized in the atmosphere. *Subject Headings:* **1. Vertical structure of the atmosphere 2. Atmospheric structure 3. Terminology.**—*Author's abstract.*

6.10–117 551.510.535:551.557

Chapman, Sydney, **Some causes of winds in the ionosphere.** *I.U.G.G. Bulletin d'Information*, 3(6):303–311, July **1954. DWB**—As the introductory paper of the Conference on Motions in the Upper Atmosphere (*see item* 6.10–17), held at Albuquerque, N. M. (Sept. 7–9 1953), the CHAPMAN paper was the only one given *in extenso* in this Bulletin. He discusses many types of evidence of winds in ionosphere, dynamic influences in lower and upper atmosphere, topography, oceanic heat transfer and storage, latent heat, energy of dissociation ionization and excitation, heat conduction, radiation absorption and emission, friction and turbulence, external impact, electrostatic and electromagnetic influences, dynamo action in ionosphere, turbulence in electromagnetic fields and dynamic action by external forces and finally, influence of lower atmosphere on ionosphere. Radio observations have played a

ıajor role in exploration of the ionosphere. *Subject Headings:* **1. Ionospheric winds 2. Iono-pheric dynamics 3. Upper atmosphere research.**—*M.R.*

6.10–118 551.510.535:550.384:551.543

Ibrahim, Z. (*Ibrahim Univ., Cairo*), **The abnormal variations of the horizontal magnetic ıtensity at Huancayo, Peru.** *Mathematical and Physical Society of Egypt, Cairo, Proceedings,* (5):21–24, May **1953.** table, figs., eqs. **DWB**—In previous papers published in the journal, alculations were made of the ionospheric current systems which would arise from lunar tmospheric tidal motions as in the Stewart-Schuster dynamo theory taking into account (I) he obliquity of the earth's magnetic axis, (II) non-isotropic conductivity of the ionosphere s a result of the reduction of the conductivity of the ionized layers caused by the earth's ıagnetic field which was pointed out by PEDERSEN, and (III) the dependence of the con-uctivity on the sun's zenith distance by taking the electron density values from MILLINGTON's harts. The current functions were calculated for equinoxes in two cases, (I) when the sun nd the moon are in the plane containing the geographic and the magnetic axes, and (II) /hen they are 90° east of that plane. In this paper the magnetic field of the derived current ystem is calculated at various points on the earth's surface and the daily variation of the orizontal component at Huancayo was found to be nearly twice in intensity as the daily ariation at Batavia. *Subject Headings:* **1. Geomagnetic variations 2. Ionospheric tides . Huancayo, Peru.**—*Author's abstract.*

6.10–119 551.510.535:551.594.13

Peiffer, H. R. and Mitra, A. P., **The effect of vertical ion transport on the night-time E-egion.** *Journal of Atmospheric and Terrestrial Physics,* 6(6):291–303, June **1955.** 10 figs., 3 refs., 11 eqs. Also issued as: Pennsylvania. State Univ. Ionosphere Research Labora-ory, Contract AF 19(122)-44, Scientific Report, No. 63, June 1, **1954.** 34 p. 15 figs., 16 efs., 7 eqs. **DWB**—Vertical ion drift in the E region, though not so large as in the F region, s sufficient to cause appreciable variations. The equations are solved and the values of the onstants discussed. E region electron distributions at different times of the night are cal-ulated from the MITRA model and compared with observations. It is difficult to separate the ffects of recombination and vertical drift; the latter is important and explains some anomalous xperimental observations. *Subject Heading:* **1. E layer ionization.**—*C.E.P.B.*

6.10–120 551.510.535:551.594.7

Sato, Teruo (*Geoph. Inst., Kyoto Univ.*), **The reflection coefficient of the long wave.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan,* (2):69–70, **1953. DWB**—In the case where the wave is reflected at the boundary at any eight (z) from the base of the ionized region and the wave does not penetrate at all to the eight above (z), the reflection coefficients for the wave of 16 kc/s are about 0.62, 0.36 and 0.24 /hen the thicknesses of the penetration region are 1, 2 and 3 km, respectively, in the case of an onic density of 3×10^5 cc. In the case where the wave penetrates to any height without imitation to the reflection point, the reflection coefficients for the wave of 16 kc/s are about .24, 0.47 and 0.77 when the gradients of the electron density with height are 10^2 cc, and $\times 10^2$ cc and 10^3 cc per 1.5 km, respectively. *Subject Headings:* **1. Ionospheric reflection oefficients 2. Long wave propagation.**—*I.L.D.*

6.10–121 551.510.536:523.59

Divari, N. B., **Fotometricheskoe issledovanie zodiakal'nogo sveta.** [Photometric nvestigation of zodiacal light.] *Astronomicheskiĭ Zhurnal,* Moscow, 29(1):49–56, **1952.** figs., 5 tables, 4 refs. **DLC**—Results of observations of zodiacal light made in the autumn f 1946 on Kamennyĭ Plateau near Alma-Ata ($\varphi = 43°.2$) and in the summer of 1947 in he Srednii Talgar canyon (Tien Shan Mountains) at an altitude of 3200 m, with a lensless ight sky photometer of Fesenkov design and another Fesenkov photometer which measures ut-of-focus images are presented and discussed. It has been found that the northern and astern zodiacal light consists of two components; the zodiacal light proper, the intensity of which is determined by the ecliptic coordinates of the section observed, and a certain surplus uminescence of the atmosphere depending on the sun's decline beneath the horizon; i.e.,

having a twilight character. *Subject Headings:* **1. Zodiacal light 2. Alma-Ata, U.S.S.R 3. Tien Shan Mountains, U.S.S.R.**—*A.M.P.*

6.10–122 551.510.536:523.5

Swings, P. (*Astrophysical Inst., Liége*), **Suggestions for new photoelectric observation of the zodiacal light and the counterglow.** *Société Royale des Sciences de Liége, Mémoires* Ser. 4, 12(1/2):215–222, **1952.** refs. **DLC**—A critical review of theories advanced by FESENKOV (1949–50) and other Soviet scientists (based on observations of zodiacal light and counter glow), relative to the possibility that the earth's atmosphere is not spherical but trails like th tail of a comet, though probably not as extensively as is the case with a comet. Theoretica aspects are analyzed and questions which should be investigated further, before the probler can be resolved, are advanced. *Subject Headings:* **1. Earth's atmosphere 2. Gaseous ta of earth's atmosphere 3. Zodiacal light 4. Counterglow. I. Fesenkov, V. G.**—*M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Flow of stratified fluids** (Long), 6.10–44; **Statistical entropy relation** (Wahl), 6.10–88.

6.10–123 551.511:551.55

Faust, Heinrich, **Vertikale Änderung der Windgeschwindigkeit und Luftdruckänderunger** [Vertical change of wind velocity and pressure change.] *Meteorologische Rundschau*, 8(1/2 19–23, Jan./Feb. **1955.** 16 figs., 7 refs. **MH-BH**—Statistics show that to the right of a shar maximum of the vertical wind distribution pressure rises, to the left it falls. This is furthe evidence for the existence of an ageostrophic component towards high pressure in the "Nul schicht." Results on the Nullschicht show that the description of atmospheric processes b geostrophic or quasi-geostrophic connections between wind and pressure field apply only a levels free from divergence. *Subject Heading:* **1. Ageostrophic winds.**—*From author's abstrac*

6.10–124 551.511:551.52

Griesseier, H., **Durch periodische Temperaturschwankungen bedingte Strömungen i einer anfänglich unbewegten isothermen Atmosphäre.** [Currents in an initially motionle isothermal atmosphere caused by periodic temperature fluctuations.] *Zeitschrift für M teorologie*, 8(2/3):42–51, Feb./March **1954.** table, 20 refs., 90 eqs. **DWB**—A frictionles compressible, and in the initial state, motionless and isothermal atmosphere is assumed with periodical turbulent heat flow resulting from a periodical variation of the temperature fie at the surface. The corresponding hydro-thermodynamic field equations are linearized and general differential equation of the fourth order is proposed. Solutions are found assuming square-cellular distribution of the temperature field. *Subject Headings:* **1. Temperatu fluctuations 2. Turbulent heat flow.**—*A.A.*

6.10–125 551.51

†*Landers, Holbrook, **Surface of least divergence and the level of least divergence.** Florid State Univ. Dept. of Meteorology, Contract AF 19(122)-466, Scientific Report, No. Nov. 15, **1954.** 62 p. 8 tables, 13 figs., 22 refs., eqs. **DWB**—A three-dimensional pictu of the horizontal velocity divergence is constructed at seven times at twelve hour interva using observed winds as a basis for divergence computations. No level of nondivergence found; however, a surface of least divergence and a level of least divergence are located at ea of the seven times and their behavior noted. A defense of the method includes comparison vertical velocities computed by another method and by the same method but with applicati of various types and degrees of smoothing. Principle conclusions are: 1) that the surface least divergence and its time changes do not correlate well with the synoptic map and i changes but that vertical velocities computed on this surface correlate very well with t precipitation pattern, 2) that various kinds and degrees of smoothing do not appreciably chan the order of magnitude of the divergence, 3) that interesting diurnal variations in divergen intensity occur when the times 0300 GCT and 1500 GCT are compared. *Subject Heading* **1. Divergence 2. Vertical velocities.**—*Author's abstract.*

6.10–126 551.511:532.5

Nakagawa, Yoshinari and Frenzen, Paul (*both, Hydrodynamics Lab., Chicago Univ.*), **Theoretical and experimental study of cellular convection in rotating fluids.** *Tellus*, Stockholm, 7(1):1–21, Feb. 1955. 4 tables, 13 figs., 23 refs., 48 eqs. **DLC**—The stabilizing and cell-shape changing influence of a basic rotation upon thermally produced cellular circulations are developed in a first order, perturbation theory. The theoretical possibility of a special "overstable" oscillating mode in certain fluids under the influence of rotation is recognized. In this preliminary report, the theory obtained for ordinary convection is compared to results obtained in laboratory experiments with rotating cylinders of water and the existence of the overstable oscillating mode is demonstrated experimentally. Several possible applications of the theoretical results to atmospheric convection are developed by means of numerical examples, including models that are consistent with the observed association of deep convection with cyclonic relative vorticity and the distribution of clouds in regularly spaced clear and cloudy areas. *Subject Headings:* **1. Atmospheric circulation 2. Convective cells 3. Fluid dynamics.**—*Authors' abstract.*

6.10–127 551.511:551.513.1

Phillips, Norman A., **Energy transformations and meridional circulations associated with simple baroclinic waves in a two-level, quasi-geostrophic model.** *Tellus*, 6(3):273–286, Aug. 1954. 5 figs., table, 24 refs., 36 eqs. **MH-BH**—The changes in geostrophic kinetic energy predicted by the "2½ dimensional" quasi-geostrophic vorticity equations without friction are shown to be compatible with the mechanical energy equation. The second-order effects on a zonal current due to the presence of very simple unstable baroclinic waves are then analyzed, using a two-level model of finite lateral width without friction or heat sources. In addition to the poleward transport of sensible heat and the creation of kinetic energy by these waves, it is shown that they are accompanied in this model by a weak meridional circulation. This circulation consists of an indirect cell in middle latitudes with direct cells to the north and south. The possible importance of this mechanism in providing appropriately distributed sources and sinks of relative zonal momentum (and therefore in prescribing the distribution with latitude of the surface zonal winds) is demonstrated with the aid of WIDGER's observations of the horizontal momentum transfer by eddies during Jan. 1946. Finally, it is shown that about 95% of the perturbation energy in the unstable waves in this type comes from the "potential energy" of the basic current, the small remainder coming from the kinetic energy. *Subject Headings:* **1. Energy transformation 2. Kinetic energy 3. Meridional circulation 4. Baroclinic models.**—*Author's abstract.*

6.10–128 551.511:551.547

Porter, Elizabeth M., **The estimation of the thickness of the 500–300 mb and 300–200 mb layers from data from lower levels.** *New Zealand. Meteorological Office, Circular Note*, No. 54, Oct. 31, 1950. 1 p. graph. **DWB**—The thicknesses of the 500–300 mb and 300–200 mb surface obtained from adiabatic charts were plotted against the corresponding 500 mb and 300 mb temperatures, respectively. A fairly well marked linear relationship was established between the 500–300 mb (D) thickness and the 500 mb temperature (Tm°C). It is expressed by $D = 15\text{T} + 3890$ geopotential feet ($D = 50\text{T} + 12{,}770$ geopotential meters). *Subject Headings:* **1. Thickness calculations (500-300 mb) 2. Thickness calculations (300–200 mb).**—*I.L.D.*

6.10–129 551.511:532.517.4

Reid, W. H., **On the stretching of material lines and surfaces in isotropic turbulence with zero fourth cumulants.** *Cambridge Philosophical Society, Proceedings*, 51(2):350–362, April 1955. fig., 5 refs., 48 eqs. With appendix by G. K. Batchelor. **DWB**—The convective effects of isotropic turbulence on arbitrary vector and scalar fields satisfying certain conservation conditions are studied under the assumption that all fourth-order cumulant tensors are zero. In the absence of molecular conduction, the behaviors of such vector and scalar fields are related to those of material lines and surfaces respectively, and the diffusive action of the turbulence results in a stretching of these lines and surfaces. The present analysis leads to a definite prediction for the corresponding strain rates which suggests that an initially spherical

material volume element is drawn out into a long thin ribbon of constant width. *Subj*
Headings: **1. Turbulence theory. I. Batchelor, G. K.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Atmos. circulation** (Pogosian), 6.10–7; **Polar atmos. circulation** (Bonnlander, Belmont), 6.10–29; **Meridional circulation** (Phillips), 6.10–127; **Upper mean flow over N. Atlantic . . .** (Hubert, Dagel), 6.10–193; **Zonal wind speed** (Winston), 6.10–195.

6.10–130 551.5

Dedebant, Georges, **A propósito de una crítica al trabajo "Circulación general del ai en la República Argentina. Historia de una investigación científica."** [Concerning a criticis of "The general circulation of the atmosphere in Argentina. History of a scientific investig tion."] *Meteoros*, Buenos Aires, 4(3):240–244, July/Sept. **1954.** 3 tables, 6 refs., eqs. **DW** —A reply to a criticism of his **Circulación general del aire en la República Argentina,** *Ibi* 3(2/3):194–246, April/Sept. **1953** (*see item* 6.1–137, Jan. 1955, *MAB*). The author sho mathematically that the double pressure wave is capable of producing maximum inte correlation between Juan Fernandez and Villa Mercedes at 13 h as indicated by SCHWERD FEGER (*see item* 6.5–64, May 1955, *MAB*). *Subject Headings:* **1. General circulation theo 2. Statistical techniques 3. Argentina.**—*I.L.D.*

6.10–131 551.5

Hawkins, Harry F., Jr. (*U. S. W. B., Wash., D. C.*), **The weather and circulation November 1954, including a study of some major circulation changes.** *Monthly Weath Review*, 82(11):335–342, Nov. **1954.** 5 figs., table, 10 refs. **DWB**—The monthly mea circulation pattern during Nov. 1954 was characterized by rather extreme storminess over t northern oceanic areas. A general account of world weather including the typhoon seaso of the weather and its anomalies over the United States, of the circulation changes of la Nov. through early Dec. and of concurrent solar variations such as sunspot activity is presente *Subject Headings:* **1. General circulation 2. Circulation patterns 3. Sunspot activi 4. United States.**—*I.L.D.*

6.10–132 551.513:551.515.7(7

Holland, Joshua Z., **The weather and circulation of June 1954.** *Monthly Weather Revie* 82(6):163–171, June **1954.** 7 figs., 12 refs. Summary p. 170. **MH-BH**—This month wa characterized by "the birth, growth and retrogression of the continental anticyclone in setting of high index over the Pacific and low index over the Atlantic." Its reflection on t temperature, moisture and precipitation patterns is described. *Subject Headings:* **1. Gener circulation 2. Anticyclones 3. Pacific High 4. United States.**—*I.L.D.*

6.10–133 551.513:551.515

Klein, William H., **The weather and circulation of May 1954.** *Monthly Weather Revie* 82(6):123–130, May **1954.** 10 figs., table, 11 refs. **MH-BH**—The very marked circulati reversal produced by a retrogressive anticyclone during an index cycle, the blocking ant cyclone associated with the index cycle and the weather are analyzed. *Subject Heading* **1. General circulation 2. Retrograde cyclones 3. United States.**—*I.L.D.*

6.10–134 551.513:515.509

Kubota, S. and Iida, M. (*Met. Res. Inst., Tokyo*), **Transfer of angular momentum in th atmosphere.** *Papers in Meteorology and Geophysics*, Tokyo, 5(3/4):224–232, Jan. 195 9 figs., table, 3 refs., 3 eqs. **DWB**—In the present paper we calculated the horizontal transf of angular momentum to carry on our investigation of atmospheric disturbances, aiming getting an idea of the model suitable for investigation of the general circulation, that is t role of horizontal motion, or to determine the critical wave number in Fourier Series. Besid we estimated the amount of eddy transfer of angular momentum, horizontal conservation angular momentum and some suggestions about the energy exchange between the disturbanc

nd the basic flow in the atmosphere. *Subject Headings:* **1. Angular momentum 2. General irculation.**—*Authors' abstract.*

6.10–135 551.513

Starr, V. P. (*MIT, Cambridge, Mass.*), **Commentaries concerning research on the general irculation.** *Tellus,* 6(3):268–272, Aug. **1954.** fig., table, 17 refs., eq. **MH-BH**—Several hases of research significant for the general circulation are reviewed briefly. The effect of otation on convective regimes is discussed. An example is given showing that mean me-idional circulations are not essential for the release of potential energy. *Subject Headings:* **. General circulation 2. Rotation of the earth.**—*Author's abstract.*

6.10–136 551.513.2:551.557

Due Rojo, Antonio, **El "Jet Stream," o rio aereo estratosférico.** [The jet stream, or tratospheric river of air.] *Granada. Observatorio de Cartuja, Trabajos Cientificos,* Ser. B, (66), **1954.** 8 p. Reprint from *Revista de Geofisica,* Madrid, No. 49, **1954. DWB**—The iscovery, explanation and characteristics of the jet stream and examples of its force and ffects on local weather, are discussed in this article. Investigations (1946–1953) conducted n the U.S.A., Australia and over the N. Pacific are summarized. It is stated that ROSSBY's, nd NAMIAS and CLAPP's models clarify the processes which accompany the jet stream but lo not explain the cause of the phenomenon. *Subject Heading:* **1. Jet stream.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Cyclogenesis forecasting** (Nagayama), 6.10–94; **Weather and circulation, Nov. 1954** (Hawkins), 6.10–131; . . . **June 1954** (Holland), 6.10–132; . . . **May 1954** (Klein), 6.10–133; **Wind angle and isobars** (Bayardelle, Roulleau), 6.10–183.

6.10–137 551.515:551.557

Faust, H., **Der Nullschichteffekt als Funktion der Schärfe des Maximums in der verti-alen Windverteilung.** [The null layer effect as a function of the sharpness of the maximum n the vertical wind distribution.] *Meteorologische Rundschau,* 8(3/4):48–50, March/April **955.** 3 figs. **MH-BH**—The life-history of pressure formations depends on the difference etween ground layer and null layer effects, the latter being the more variable. One factor s the sharpness of the maximum of vertical wind distribution and the relation of this to the geostrophic flow towards higher pressure in the null layer is investigated. For Germany in 953 this sharpness was measured by $S = 2\ v_{225}/(v_{175}+v_{275})$. It appears that the wind in the ull layer is more strongly supergradient the larger S, and is greater in cyclonic than anti-yclonic regions. *Subject Headings:* **1. Null layer 2. Upper air winds.**—*C.E.P.B.*

6.10–138 551.515.1:551.515.8(52)

Ishii, Y. and Takeishi, Y., **On the local coastal cyclone and local cold air mass.** *Journal f Meteorological Research,* Tokyo, 5(10/12):782–785, Jan. **1954.** 5 figs. In Japanese; English ummary p. 786. **MH-BH**—In the present paper the authors investigated the local coastal yclone which appears on the western coast of Hokkaido, in relation to the local cold air mass hich grows in the snow-covered inner land in which the surface is extremely cooled by noc-urnal effective radiation: (1) The above relation is made clear from the comparison of air emperature and sea level air pressure between the coast and inner land. (2) The height of old air mass is about 15,000 m in winter. (3) The cyclone is occasionally accompanied by eavy snowfall. (4) The water temperature of sea surface is an important factor of cyclone ormation. *Subject Headings:* **1. Cyclone-cold air mass relationships 2. Cyclone formation . Japan.**—*Authors' abstract.*

6.10–139 551.515.1(262)

§Kruhl, —, **Die Genua-Sturmzyklone vom 19. Februar 1955.** [The Genoa storm cyclone f 19 Feb. 1955.] *Wetterlotse,* No. 84/85:52–55, March **1955.** 3 figs. **DLC**—Also: Rodewald, M., **Die Schäden des Februar-Sturms 1955 in Genua.** [The damage of the February 1955 torm in Genoa.] *Ibid.,* 69–72. **DLC**—The cause of this storm, which did a great deal of

damage, was a depression which advanced from the Bay of Biscay across southern France the Mediterranean, reaching the Gulf of Genoa at 10 h on the 19th. At 5000 m there was deep depression over the North Sea, which pushed the polar front down into the Mediterranea where it came into juxtaposition with warm air from the Sahara. There was a rapid fall pressure over the Ligurian Gulf and a rise to the west, giving winds of force 8–9. The d pression moved away to the north-east. RODEWALD states that a storm from south-west very rare in Genoa. He discusses the damage caused by the storm. *Subject Heading* **1. Extratropical cyclones 2. Gulf of Genoa.**—*C.E.P.B.*

6.10–140 551.515.11:551.5

Bristor, Charles L. (*U. S. W. B., Wash., D. C.*), **Central pressure trend as a predict of cyclone deepening. 1950.** 3 p. 4 figs., table, 2 refs. Typescript. **DWB**—Centr pressure profiles for 115 cyclones within the area east of the Rockies were obtained from WBA Analysis Center three-hourly U. S. surface charts for 20 winter months. In three statistic tests the correlation of these profiles with persistence of deepening or filling trends, wi duration of deepening or filling cycles, and with persistence of tendencies after they fi reach a given magnitude, is analyzed. The correlations are graphically represented. It found that central pressure tendencies in themselves "seem to be of doubtful value particular when utilized for the forecast of central pressures as much as 24 hours in advance." T author does not, however, exclude the possibility that the central pressure profile might successfully used as an added parameter along with other proper parameters which wou specify "the amount of energy available for transfer into kinetic energy . . . and the ra of such transformation." *Subject Headings:* **1. Pressure trends 2. Deepening 3. Pressu forecasting 4. Pressure correlations 5. Persistence.**—*G.T.*

6.10–141 551.515.

Zubian, Zh. D., **Vozniknovenie i razvitie tsiklonov.** [Origin and development of cyclones Leningrad, Gidrometizdat., **1949. Biblioteka Sinoptika,** No. 1. 52 p. 7 refs., numero figs. **DLC.** Also translation into English under title "**Origin and development of cyclon and anticyclones.**" 77 p. lacks figs., translator not indicated. Mimeo. **DWB**—The ne series **Biblioteka Sinoptika** attempts to popularize among students and meteorologists t best practices in synoptic meteorology as worked out by Soviet scientists which "far surpa the achievements of foreign scientists." The general advective-dynamic theory, KIBEL method of predicting pressure change, general principles of pressure change, geostrophic wind advective temperature changes, frontogenesis, frontolysis, etc. and, finally, the effect of these dynamic and thermodynamic factors in cyclo- and anticyclogenesis are discussed. *Su ject Headings:* **1. Cyclone theory 2. Cyclogenesis 3. Translations.**—*M.R.*

6.10–142 551.515.2(74):551.509

§*U. S. Weather Bureau, **Storm of Sept. 11, 1954. Hurricane Edna, Sept 11, 1954.** N. Y U. S. Weather Bureau, [**1954?**] [12 p. unpaged] tables, charts. **DWB**—Included in th report is a brief summary of the history of "Edna" and numerous advisories issued by Mian Washington, New York and Boston from Sept. 6 to 11, 1954, plus tabular data (hourly repor from 20 coastal or nearby stations in New England or the Middle Atlantic states), synopt charts, anemograph and barograph records, chart showing tracks of "Edna" and 2 other Sep hurricanes that affected New England (1938 and 1944). The central pressure at 1330 E.S. on Sept. 11, 1954 was 955 mb off Cape Cod. *Subject Headings:* **1. Hurricane "Edna" (Sep 1954) 2. New England hurricanes 3. Hurricane advisories 4. New England.**—*M.R.*

6.10–143 551.515.23(26

§*Kobe, Japan. Imperial Marine Observatory, **Some statistical diagrams of tropic cyclones on the Western North Pacific.** [date?] 36 p. almost entirely charts. In Ja anese; title-page, table of contents and legends also in English. **DWB**—Contains synopt and statistical charts illustrating typhoon frequencies, tracks and types in the West Pacif The following sections are included: 1) Frequency of origin in 5° squares for each seaso 2) Total frequency of tracks crossing each 3° square, monthly June–Nov. and seasonal Dec May; 3) Frequency distribution of direction of motion in each 5° square (monthly); 4) Spe

of movement in each 5° square (monthly); and 5) Frequency of pressures reaching the minimum value for the entire history of the typhoon in each 3° square. In Pt. 2 typical tracks and sequences of synoptic charts illustrating marked development and location in each month or season accompany statistical charts for 0° to 55°N and 105° to 160°E. *Subject Headings:* **1. Typhoon tracks 2. Typhoon statistics 3. Western Pacific.**—*M.R.*

6.10–144 551.515.3/4

§Abbott, S. G., **The thunderstorms and tornadoes of 8 December 1954.** *Weather*, 10(5): 142–146, May **1955.** 2 figs., 2 photos, table, ref. **DWB**—The synoptic chart for Dec. 8, and upper air conditions over S.E. England are shown. Severe thunderstorms developed in Mp air in the rear of the occlusion and tornadoes occurred in Dorset and between the Isle of Wight and London, doing much damage (illustrated by photos). *Subject Headings:* **1. Thunderstorms 2. Tornadoes 3. England.**—*C.E.P.B.*

6.10–145 551.515.1(436)

Eckel, O., **Das Unwetter vom 12. September 1954 in Oberösterreich.** [Stormy weather of September 12, 1954 in upper Austria.] *Wetter und Leben*, Vienna, 6(7/9):167–168, **1954. MH-BH**—Cyclonic activity over the Eastern Atlantic began to influence the weather, led to a storm front which reached Salzburg on Sept. 16 and reached Vienna with a velocity of 100 km/hour. The rainfall intensity, the areas of highest rainfall and the damage caused are discussed. *Subject Headings:* **1. Cyclonic activity 2. Storm rainfall 3. Rainstorm damage 4. Austria.**—*I.L.D.*

6.10–146 551.515.3:551.556.1

U. S. Federal Civil Defense Administration. Dallas Regional Office, **The Waco disaster, May 11, 1953. A narrative history. . . . 1953.** 48 p. Appended: General Adjustment Bureau, Inc. **Waco, Texas Tornado, May 11, 1953: Property loss estimated in excess of $20,000,000. Monster from the skies.** May **1953.** 12 p. mostly photos. **DWB**—Mainly a discussion of various phases of civilian defense as applicable to major disasters and how the various agencies and organizations functioned during the Waco Tornado of May 11, 1953 and the subsequent flood which wiped out 2 square miles of the business section and did great damage elsewhere in Waco, Texas. The meteorological factors and services are given slight notice, but many excellent pictures of the damage and a map showing path and extent of damage to various sections of Waco are appended. Rainfall totaled 9.57 in. in 5 days. *Subject Headings:* **1. Tornado, Waco (May 11, 1953) 2. Tornado damage 3. Floods 4. Excessive rainfalls 5. Waco, Texas.**—*M.R.*

6.10–147 551.515.3

Waterspouts [in] North Atlantic Ocean. *Marine Observer*, 25(169):150–151, July **1955.** 1fig. **MH-BH**—Account of 7 small waterspouts ahead of a heavy rain squall in 21°44′N, 75°19′W on Sept. 9, 1954. On July 16, 1954, 9 waterspouts were seen. *Subject Headings:* **1. Waterspouts 2. North Atlantic.**—*C.E.P.B.*

6.10–148 551.515.8:551.576.1

Brewster, George F. (*U. S. W. B., Wash., D. C.*), **Observation of two squall lines, August 16, 1954.** *Monthly Weather Review*, 82(8):245–247, Aug. **1954.** 5 figs. **DWB**—The author presents an eye witness account of cloud phenomena associated with two squall lines which passed near Leesburg Pike on Aug. 16, 1954 during the time of occurrence of two pressure jump lines. Sketches of the peculiar cloud formations and protrusions are reproduced and their development and behavior are described. *Subject Headings:* **1. Squall lines 2. Cloud formations 3. Leesburg Pike, Virginia.**—*I.L.D.*

6.10–149 551.515.8:551.576.1

§Matthewman, A. G., **A study of warm fronts.** *Great Britain. Meteorological Office Professional Notes*, 7(114), **1955.** 23 p. 10 figs., 9 tables, 11 refs. At head of title *M.O.* 524n. Also: Sawyer, J. S. and Dinsdale, F. E., **Cloud in relation to active warm fronts near Bircham Newton, 1942–46.** *Ibid.*, 7(115), **1955.** 10 p. 14 tables, ref. At head of title

M.O. 524o. **DWB**—Matthewman analyzes the warm front affecting the British Isles o Oct. 24–25, 1949, with synoptic charts, upper air ascents and vertical cross sections 66°2′E Gibraltar and Jan Mayen–Lisbon every 6 hrs. Behavior of jet streams in relation to th front is examined. In Pt. 2 cloud Jan. through March 1942 near Bircham Newton is examine in warm fronts, warm occlusions and quasistationary fronts. Fronts are grouped in classe from 1) no cloud to 6) continuous cloud from near ground to 400 mb, and a number of relation to frontal characteristics worked out. The closest (+0.5) was with the difference between th speed of the warm air normal to the front at the upper surface of the frontal zone and th speed of the surface front. Sawyer and Dinsdale examined cloud structure of 76 warn fronts using Matthewman's classification. The only useful correlation (+0.4) was with th wind relative to the surface front taken normal to its upper boundary. *Subject Heading* **1. Warm front clouds.**—*C.E.P.B.*

6.10–150 551.515.81:551.558.2

Sawyer, J. S., **Some characteristics of fronts and their relation to frontogenesis.** *Gre Britain. Meteorological Research Committee, M.R.P.* 896, 31 Dec. **1954.** 14 p. 12 figs, table, 12 refs., 12 eqs. Mimeo. **DWB**—A front is regarded as an area into which activ confluence of air currents at different temperatures is taking place. It is shown that frontc genesis must be accompanied by a vertical circulation. Air trajectories at surface–300 mb are drawn and discussed. Temperature changes are consistent with a vertical circulatio upwards in the warm air and downwards in the cold air. The field of frontogenesis nea well defined precipitating fronts is examined and the theory of confluence is applied to differen fields of specific volume. *Subject Headings:* **1. Fronts 2. Vertical motion of fronts.**—*C.E.P.B*

RADIATION AND TEMPERATURE

RADIATION

See also: **Spectrophotometry of global radiation** (Cooper, Probine), 6.10–79; **Solar radiation, weather lore** (Schulz), 6.10–109.

6.10–151 551.521:0

Drummond, A. J., **Radiation activities at Rome.** *South Africa. Weather Bureau, New Letter*, No. 67:7–8, Oct. 31, **1954.** **DWB**—Brief report on joint meeting of WMO and IUG radiation sub-commissions held at Rome, on Sept. 8–13, 1954, problems discussed and 3-yea program for improvement of actinometric, pyrheliometric, radiation balance, UV radiatio and scattering or absorption investigations, instruments, etc. *Subject Headings:* **1. WMO Radiation Commission 2. WMO. meetings 3. Rome, Italy.**—*M.R.*

6.10–152 551.521:0

International Radiation Conference. *World Meteorological Organization, WMO Bulletin* 4(1):17–18, Jan. **1955.** photo. **DWB**—Joint session of Working Group on Radiation o CIMO (WMO) and Radiation Commission of IAM (I.U.G.G.) met jointly in Rome 8–1 Sept. 1954. Twenty-one participants representing 13 countries discussed the followin specific problems: standard scales and instruments; use of filters in actinometry; actinometri turbidity determination; shielding for diffuse sky measurement; radiation balance calculatio from UV, visibility and long wave measurements of various types; and instrumental errors i Campbell-Stokes sunshine recorders. *Subject Headings:* **1. Radiation conferences 2. WMO Radiation Commission 3. I.U.G.G. Radiation Commission.**—*M.R.*

6.10–153 551.52

Sapozhnikova, S. A., **Priblizhennye raschety sutochnogo khoda radiatsionnogo balans v dnevnye chasy i ispol'zovanie ikh dlia opredelniia vremeni nastupleniia i razrusheniia nochno inversii.** [Approximate calculation of daily variation of radiation balance during daylig and its use in determining the time of onset and disintegration of the nocturnal inversion. (In: Solovečhik, R. E. (*ed.*), **Fizika Atmosfery,** Leningrad, Gidrometizdat, **1946.** p. 19–29

figs., tables, 9 refs.) **DLC**—The relationship between desert solar radiation upon a horizontal urface R with the height of the sun is expressed by the equation $R=1.1\ h.^{-10}$ (values of $h.$ egin with 10°). The diurnal variations of direct solar radiation at lat. 50° for different egrees of turbidity are determined. On the basis of the assumption that the daily variation f radiation balance during the daylight hours depends upon the locations of direct radiation, ence upon the solar altitude, and by taking into account the times of zero values, the author alculates the daily radiation balance for Tashkent. It is shown that the solar elevation of 0–15° as an index of zero radiation balance can be used as a first approximation for forecasting he formation and destruction of the nocturnal inversions in the lowest 1.5–2.0 meters above the round. The criteria for precise forecasting of the appearance of the inversions are outlined nd calculated data for latitudes 40–60° are given. *Subject Headings:* **1. Radiation calculations . Radiation variations 3. Radiation balance 4. Nocturnal inversions.**—*I.L.D.*

6.10–154 551.521.1(68/691)

*Drummond, A. J. and van Deventer, E. N., **The atmospheric transmission of solar energy ver southern Africa.** *South Africa. Weather Bureau, Notos,* 3(4):272–286, **1954.** 4 figs., tables, 12 refs. **DWB**—A description of the radiation program in South Africa and an ntegrated analysis of the various aspects of solar radiation depletion by the atmosphere over S. and E. Africa, based on data from 8 stations (Nairobi, Windhoek, Pretoria, Bloemfontein, Durban, Cape Town, Mt. Brukkaros and Tananarive) for periods from 10 months to $6\frac{1}{2}$ rs, and comparison with data for sections of the U.S.A., Europe, Indonesia and other areas. tudy includes details of global and diffuse short wave radiation, solar constant for latitude f South Africa, albedo (surface of earth 13% on clear days in Feb. and June, 7% on cloudy lays; total albedo of earth and atmosphere 20%, 22% and 36%, respectively). *Subject Headings:* **1. Radiation climate of South Africa 2. Albedo 3. Solar radiation networks . South Africa.**—*M.R.*

6.10–155 551.521.12 551.506:551.521

*Mackiewicz, Maria (*Inst. of Geophysics, Warsaw Univ.*), **The space distribution of in- olation in Poland.** *Acta Geophysica Polonica,* Warsaw, 1(2):100–121, **1953.** 6 figs., tables, 2 refs. In English; Polish summary p. 120. **MH-BH, DWB**—This is a detailed study of the pace distribution of insolation and of the influence of various physical processes on solar adiation in its path through the atmosphere. It is based on an elaborate analysis of a series f radiation intensity measurements in Warsaw for the years 1930–1938 (calculated by the uthor), as well as on numerous data published by professors Gorczyński and Stenz. Questions of intensity of solar radiation, of the transmission of radiation in the atmosphere nd of the distribution of insolation are examined and discussed separately. The study shows hat the distribution of insolation in the year illustrates a diminution of incoming energy n the north, and a maximum in the southeast and central parts of the country and near the Bay of Gdansk. The amounts of incoming energy range between 51.0 and 64.2 k cal/cm² ear. Many tables and graphs illustrate the paper. *Subject Headings:* **1. Insolation 2. Radi- tion intensities 3. Radiation measurements 4. Poland.**—*A.M.P.*

6.10–156 551.521.3:519.241.1

Livshits, G. Sh., **"Korotkiĭ" metod opredeleniia koeffitsienta prozrachnosti zemnoĭ tmosfery po iarkosti neba pri snegovom pokrove.** [A "short" method for determining the ransparency coefficient of the earth's atmosphere on the basis of sky brightness during snow over.] *Akademiia Nauk SSSR, Doklady,* 100(2):251–253, Jan. 11, **1955.** table, 3 refs., 6 eqs. **DLC**—The coefficient of transparency is obtained from the following empirical formulas based on a large number of visual observations

$$p=0.973-9.8\mu \ (60)$$
$$p=0.977-14.08\mu \ (90)$$

where p = coefficient of transparency of the earth's atmosphere, μ (60) and μ (90) are coefficients f diffusion at angles of 60° and 90° with the direction of incident light. Results of calculations re presented. *Subject Headings:* **1. Atmospheric transparency determination 2. Coefficients f transparency.**—*I.L.D.*

6.10–157 551.521.3:551.591.

*Oskanjan, V., **Determinations visuelles de l'extinction.** [Visual determination of ex tinction.] *Belgrade. Observatoire Astronomique, Bulletin,* 17(1/2):17–25, **1952.** pub. 195 5 tables, 4 figs. At head of cover-title: Académie Serbe des Sciences. **DLC**—Tables of visua extinction coefficients for stars are given for different elevation and azimuth angles. Th effect of the City of Belgrade is evident on the polar chart in a diminution of the transparency with the result that the coefficient of absorption is higher at Belgrade Observatory than a any other astronomical observatory known to the author. Concludes that it is not a very goo place for such observations. A chart shows location of the observatory with respect to to pography and to the settled area of Belgrade. *Subject Headings:* **1. Extinction coefficien 2. Visibility 3. Astronomical observatories 4. Belgrade, Yugoslavia.**—*M.R.*

6.10–158 551.521.1

Wegener, Kurt, **Die Solarkonstante aus Strahlungsmessungen.** [The solar constan from radiation measurements.] *Meteorologische Rundschau,* 8(3/4):65–66, March/April 195 6 refs. **MH-BH**—From the radiation at the wave-length of maximum (2870) the value o 2.4 is deduced for the solar constant instead of Abbot's value of 1.94. The reasons wh 1.94 is too low are set out. *Subject Heading:* **1. Solar constant.**—*C.E.P.B.*

6.10–159 551.521.31:523.7

Bronshten, V. A., **O iarkosti neba vo vremia polnogo solnechnogo zatmeniia.** [Th brightness of the sky at the time of a total eclipse.] *Astronomicheskiĭ Zhurnal,* Moscow 29(6):718–727, **1952.** 3 figs., 2 tables, 9 refs., 23 eqs. **DLC**—The theory of the brightness o the glow ring (light scattering of 1st order) and of the sky brightness during a total eclipse a any position of the observer relatively to the axis of the cone of the moon's shade, develope by the author, is presented and discussed. Author concedes that the theory is not perfec in as much as it is based on the premise that the distance from the observer to the shad boundary is sufficiently large in comparison with the distance to the elements of the ai producing a scattering of 2nd order, i.e., that $r \gg H_2 \operatorname{b\bar{o}} z$. The formula becomes inapplicabl at some values of μ (about 70°). A comparison of the theory with observation results ob tained by photometry of the sky during the eclipse of June 19, 1936 made by the expeditio of the Moscow division of the All-Union Astro-Geodetic Society at Sagarchino with aid o photographic photometers showed good agreement. This proves that the theory can b applied for the calculation of scattered light of the sky by the photometry of the sun's corona *Subject Headings:* **1. Solar eclipses 2. Sky brightness.**—*A.M.P.*

6.10–160 551.521.32:546.3

Blamont, Jacques-Émile, **Nouvelle méthode d'observation de l'émission atmosphériqu des raies D du sodium.** [New method for observing atmospheric emission of the D lines o sodium.] *Académie des Sciences, Paris, Comptes Rendus,* 237(21):1320–1322, Nov. 23, 1953 fig., 2 refs. **DWB**—The author presents preliminary results of measurements of D lines o sodium made at Haute Provence Observatory with a radiation meter having a magneti selector with a sensitivity of 10^{-2}Å. Three types of radiation are differentiated by means o this apparatus. *Subject Headings:* **1. Emission spectra 2. Sodium D line 3. Haute Provenc Observatory, France.**—*Trans. of author's abstract.*

6.10–161 551.521.

Galbraith, W. and Jelley, J. V., **Light-pulses from the night sky and Čerenkov radiation Pt. I.** *Journal of Atmospheric and Terrestrial Physics,* 6(5):250–262, May **1955.** 4 figs 2 plates, 2 tables, 9 refs., 8 eqs. **DWB**—The properties of night sky radiation were investigate on moonless nights on the Pic du Midi. Apparatus is described, including polarization ex periments, directional properties of the light and experiments with color filters. It is conclude that part at least of the light detected is Čerenkov radiation and arises in the cores of ai showers where the density of particles is high. Čerenkov radiation is described in the Ap pendix. *Subject Headings:* **1. Čerenkov radiation 2. Night sky emission theories 3. Pi du Midi, France.**—*C.E.P.B.*

6.10–162 551.521.4

Jelley, J. V. and Galbraith, W., **Light pulses from the night sky and Čerenkov radiation, Pt. 2.** *Journal of Atmospheric and Terrestrial Physics*, 6(6):304–312, June **1955.** 5 figs., 2 tables, 10 refs. **DWB**—Pt. 2 describes further experiments on the Pic du Midi. The height distribution of the light pulses above height H was $N(>H) \propto H^{-1.6}$; they fall off much more sharply than night sky noise. Firing of a Geiger counter falls off slowly with distance up to 120 m from the light receiver. Variations of light pulses with zenith and azimuth angles and with time were examined; no point sources were found. (For Pt. I, *see item* 6.10–161.) *Subject Headings:* **1. Čerenkov radiation 2. Night sky emission theories 3. Pic du Midi, France.**—*C.E.P.B.*

6.10–163 551.521.4

St. Amand, Pierre and Pettit, Helen B., **A comment on a four year study of the [OI] 5,577 in the night glow.** *Annales d'Astrophysique*, Paris, 17(5):427–428, Sept./Oct. **1954.** fig., table, 2 refs. **MH-BH**—In a previous article (*see item* 5.7–96, July 1954, *MAB*), the authors "made a statement that did not convey the idea they intended to express." In this note they clarify that statement to the effect that the intensity of [OI] 5 577 Å in the night-glow cannot be predicted for a given night. *Subject Heading:* **1. Night airglow spectrum.** —*G.T.*

6.10–164 551.521.6:551.507.362

Bedinger, J. F. (*U. S. A. F. Cambridge Res. Center, Mass.*), **Day airglow measurements with rocket-borne photometer.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 10–16. 6 figs., 3 tables, ref.) **DWB**—Measurements of zenith sky intensities have been made up to an altitude of 135 km. Rocket-borne photo-electric photometers employing interference filters of 150 Å bandwidth were used to measure the intensity in selected regions of the visible spectrum. At altitudes above the atmosphere scattering region (35 km) the intensity appears to be nearly constant with altitude and is much larger than expected. The high altitude light denoted by day airglow is as great as 3% of the daytime ground value. Evidence of diurnal variations in the day glow has been obtained. *Subject Headings:* **1. Radiation research 2. Rocket soundings 3. Day airglow.**—*Author's abstract.*

6.10–165 551.521.61:551.594.51:535.33

Meinel, A. B. (*Yerkes Observ., Wisc.*), **The near-infrared spectrum of the aurora.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 30:75–94, July **1954.** 11 figs., 17 refs. Discussion p. 87–93. **MH-BH**—The study of the infrared auroral spectrum has provided a greater insight into the physical state of upper atmospheric gases during an auroral display. The chief results of the study of this spectral region have been the conclusive identification of permitted atomic lines of (OI) and (NI) and the new identification of two band systems, one of which is still unobserved in the laboratory. The new band system has been identified as being due to the $A^2\Pi$–$X^2\Sigma$ transition of N_2^+. This identification, based solely upon the derived molecular constants, is unique in that these bands have never been obtained in the laboratory, although the $A^2\Pi$ level is known to exist through perturbation in the high vibrations states of the ground $X^2\Sigma$ state of N_2^+. The $B^3\Pi$–$A^3\Sigma$ first positive system of molecular nitrogen is responsible for the most intense features of the infrared auroral spectrum in this wavelength range. The intensities of the bands change with vibrational number in an orderly manner, indicating that no selective effects are present. *Subject Headings:* **1. Infrared spectrum of aurora 2. Auroral spectra.**—*From author's abstract.*

6.10–166 551.521.63:550.385

Das, A. K. (*Solar Physics Observ., Kodaikanal*), **Solar radiation in the far ultraviolet and some related geophysical phenomena.** *Indian Journal of Meteorology and Geophysics*, Delhi, v. 5, Spec. No.:141–152, Dec. **1954.** table, 17 refs., 5 eqs. **DWB**—It has been known for a long time that apart from the visible and heat radiations of photospheric origin there are other radiations which emanate from the sun and produce notable effects on the earth's atmosphere

and on the surface of our planet. Some of these effects, such as the annual means of geomagnetic variations, the frequencies of polar lights, the variations in the brightness of the night sky, the water levels of the different lakes and inland seas, the thickness of the annual rings of trees, etc. exhibit a remarkable parallelism with sunspot activity. The object of the present article is not to deal with all these various effects; we shall restrict our considerations mainly to the effects of solar ultraviolet radiation on the outer atmosphere of the earth and on the variations of the geomagnetic field, our principal aim being to derive, from available terrestrial observations, conclusions regarding the nature and the intensity of the ultraviolet radiation emanating from the sun insofar as they seem justifiable on the basis of theoretical considerations and plausible hypotheses. *Subject Headings:* **1. Ultraviolet radiation 2. Geomagnetic field variations 3. Outer atmosphere.**—*Author's abstract.*

TEMPERATURE

See also: **Temperature observations in fields** (Sato), 6.10–55; **Problems in modern weather service** (Scherhag), 6.10–101; **Atmos. currents caused by temp. fluctuations** (Griesseier), 6.10–124; **Energy exchange water-air** (Nyberg, Raab), 6.10–172; **Ice formations** (Gressel), 6.10–214; **Temp. near ground** (Takeda, Motoki), 6.10–270; **Rotational temp. of auroral N_2^+ bands** (Jones, Harrison), 6.10–287; **Rotational temp. of auroral N bands** (Shepherd, Hunten), 6.10–291.

6.10–167 551.524.2

*Villeneuve, G. Oscar (*Met. Bureau, Quebec*), **Valeurs calorifiques.** [Accumulated temperatures.] *Quebec (Province). Bureau de Météorologie, Bulletin,* No. 27, **1954.** 9 p. fig., 2 tables, 8 refs. **DWB**—Semi-monthly degree-day values for Quebec (City), P.Q., are tabulated for the winter periods 1948–1953 (54). The tabulation is based on daily degree-day data obtained at the Bureau of Meteorology of the Dept. of Lands and Forests, Province of Quebec. Monthly averages of these data are compared with those of the Met. Div., Dept. of Transport, Canada (50-year period) with fair agreement. *Subject Headings:* **1. Degree day data 2. Heating degree days 3. Quebec, Canada.**—*G.T.*

6.10–168 551.524.36:551.589.1:519.4

Essenwanger, O., **Zur Häufigkeitsanalyse von Grosswetterlagen.** [On the frequency analysis of broad-weather situations.] *Meteorologische Rundschau,* 8(3/4):55–56, March/April **1955.** 3 figs., 7 refs. **MH-BH**—Normal frequency curves disguise the characteristics of a complex distribution. Author's method (1954) distinguishes a number of component normal distributions. This is illustrated by frequency curves of temperature for Karlsruhe and Bremen for weather type HM. These separate polar, subtropical maritime and subtropical continental air and other types. The characteristics of the curves for different seasons are discussed from the climatic viewpoint. *Subject Headings:* **1. Air mass climatology 2. Temperature frequencies 3. Statistical techniques 4. Grosswetterlagen.**—*C.E.P.B.*

6.10–169 551.524.37(42)

Manley, Gordon, **The winter of 1798–9.** *Weather,* 9(8):254, Aug. **1954.** table. **DWB**—Description of a "trying" winter in England with very low temperatures on Dec. 28, N.E. winds at end of Jan. and heavy snow on Feb. 8–9, alternating with warm spells. *Subject Headings:* **1. Severe winters 2. England.**—*C.E.P.B.*

6.10–170 551.524.37:551.588.2

Uhlig, Siegried, **Beispiel einer kleinklimatologischen Geländeuntersuchung.** [Sample of a microclimatological terrain survey.] *Zeitschrift für Meteorologie,* 8(2/3):66–75, Feb./March **1954.** 7 figs., tables, 13 refs. **DWB**—An objective point system for the evaluation of terrain effects on the probability of killing frosts is proposed. The influence of topographic features is characterized by numbers (0–10) with a detailed consideration of slopes, elevations and curvatures. Other features are vicinity of meadows, fallow, bushes, forests and other obstacles and the vicinity of lakes and rivers. The total of points ranging from 0 to 35 is divided into four groups and 10 subgroups giving directly the frequency of expected frost

occurrences. As an example, a survey in North Württemberg is discussed. The evaluation gave a reasonable agreement with the measured distribution of temperature minimum. *Subject Headings:* **1. Killing frost probabilities 2. Topographic effects 3. Württemberg, Germany.**—*A.A.*

6.10–171 551.524.37(795)

*U. S. Weather Bureau, **Oregon sub-freezing temperature data, 1921–1950.** Prepared by the Climatological Section center for Oregon Weather Bureau Office, Portland, Oregon, Jan. **1954.** 5 p. mostly tables. Price: 5 ¢, from Govt. Print. Office, Wash., D. C. **DWB**—Average and extreme data of latest occurrence in spring and earliest in fall of temperatures of 32°, 28°, 24°, 20° and 16°F for all Oregon stations with complete records for 1921–50 (52 areas) are tabulated. There are some places (e.g., Newport) where temperatures of 32° or less have not occurred throughout an entire winter, and others (e.g., Bend) where the earliest 32°F was July 1 and the latest June 30 and others (e.g., Fremont) where even 20°F was recorded as early as July 2 and as late as June 30. *Subject Headings:* **1. Freezing temperature data 2. Summer frosts 3. Oregon.**—*M.R.*

6.10–172 551.524.4:551.526.8

Nyberg, A. and Raab, L. (*Swedish Met. and Hydrolog. Inst.*), **A remark on the energy transport from a warm river surface into cold air.** *Tellus*, Stockholm, 5(4):529–532, Nov. **1953.** 2 figs., table, 3 refs. **MH-BH**—Temperature measurements in very cold air above an open river surface indicate that in spite of very high temperature lapse rate (temperature of river, in the 2 cm, 10 cm, and 12 m levels are +0.5, −14.0, −15.3, and −18.0°C, respectively), the eddy conductivity is of the same order of magnitude as in extremely stable conditions (e.g., above a snow surface during nocturnal cooling). *Subject Headings:* **1. Energy exchange river-atmosphere 2. Eddy conductivity.**—*Authors' abstract.*

6.10–173 551.524.7(99)

*Schumacher, Nils Jørgen (*Norsk Polarinstitutt, Oslo*), **Upper air temperatures over an Antarctic station.** *Tellus*, Stockholm, 7(1):87–95, Feb. **1955.** 3 figs., 2 tables, 13 refs. **DLC**—Typical features of Antarctic upper air temperature distributions are demonstrated by means of average values and selected ascents from Maudheim (71°S, 11°W) 1950–1952. A great seasonal change in the height of the tropopause is pointed out. Attention is drawn to the remarkable agreement between observed stratospheric temperatures in winter and Dobson's estimated values. The causes for the heating of the stratosphere in late winter and spring are discussed. The difference between the tropospheric temperatures in summer between Arctic and Antarctic is assumed to be due to the different value of the surface albedo. Rough estimates indicate that the absorption in the 9.7μ band by ozone is of great significance to the observed stratospheric temperature contrast between the two polar regions in winter. *Subject Headings:* **1. Upper air temperatures 2. Maudheim, Antarctica.**—*Author's abstract.*

PRESSURE AND WIND

PRESSURE

See also: **Surface currents and weather, Baltic sea** (Manegold), 6.10–41; **Short period atmos. pressure variations** (Teichert, Kohn), 6.10–80; **Magnetic intensity, Huancayo** (Ibrahim), 6.10–118; **Wind angle and isobars** (Bayardelle, Roulleau), 6.10–183; **Lee waves** (Rovesti), 6.10–203; **Lee waves** (Wurtele), 6.10–204.

6.10–174 551.543

Schaffhauser, E. and Schaffhauser, J. (*Fribourg*), **Über Herkunst und Ausbreitung der natürlichen Luftunruhe (Luftseismik).** [Origin and propagation of natural atmospheric oscillations (air-seisms).] *Helvetica Physica Acta*, Basel, 25(5):480–485, Sept. 15, **1952.** 2 figs., 4 refs., eqs. **DLC**—Describes and discusses 2 cases of pressure wave recordings reg-

istered in 1950 and 1951 by a special apparatus devised by one of the authors for measuring direction, origin and propagation speed of short periodic air pressure waves. Similar measurements, were made in 1940 with 3 stations, by GUTENBERG and BENIOFF in America. They assumed that the emission source was in the low pressure area between S.W. and W. After stating that the propagation of pressure waves can be caused by sound or gravitation waves (surface waves), the authors analyzed the numerous factors refracting the course of propagation: oscillations, marginal surfaces, fronts, changes of inversion layer heights, variations of temperature gradients, and especially the influence of winds. They concluded that such phenomena are essentially due to frequency propagation by gravitation waves. If the limiting frequency occurs in the given frequency range, it is possible to explain the phenomena by air pressure variations. An approximate calculation shows that the limiting frequency, or the corresponding vibration rate, is between 30 and 60 sec. which is too long for gravitation waves. Thus, the question to be resolved remained undetermined. *Subject Headings:* **1. Pressure waves 2. Pressure oscillations 3. Pressure wave propagation.**—*A.M.P.*

6.10–175 551.543.3

Nagao, T., **30-day period of air pressure variation at Oodomari and in its neighborhood.** *Journal of Meteorological Research*, Tokyo, 6(1/3):31–37, March **1954.** 4 figs., table. In Japanese; English summary p. 31. **DWB**—In this paper the author analyzed the 30-day period of air pressure variation which is often found at Oodomari and in its neighborhood in summer, and the following results were obtained. 1. Periodic change mostly develops in summer, and its amplitude becomes larger when the North Pacific High stretches over the northern part of Japan proper and the Okhotsk Sea. 2. When an anticyclone develops in the Japan Sea and Okhotsk Sea, cold damage is apt to occur in the northern part of Japan proper, and there is no periodic oscillation at Oodomari. 3. When an anticyclone develops in the southern sea of Japan proper, dry damage occurs in Japan proper, and periodic oscillation develops more than in normal years. 4. Then it follows that the necessary condition of oscillation development is established when the North Pacific High has stretched over northern Japan. 5. The above change is considered a stationary oscillation, but its spatial distribution is not given. *Subject Headings:* **1. Pressure variations 2. North Pacific High 3. Otomari, Japan.**—*Author's abstract.*

6.10–176 551.547:550.38

Brier, Glenn W. and Enger, Isadore, **Comments on "Relation between geomagnetic activity and pressure variations aloft."** *Journal of Meteorology*, 12(3):285, June **1955.** Also: Kaciak, William, **Reply [to same].** *Ibid.*, p. 285–286. **DWB**—BRIER and ENGER criticize the statistical basis of the results of KACIAK and LANGWELL (*see item* 4.7–119, July 1953, *MAB*). KACIAK replies that their points were allowed for. *Subject Headings:* **1. Upper air pressure 2. Geomagnetic activity.**—*C.E.P.B.*

TURBULENCE

See also: **Gust experienced in flight** (Crim), 6.10–47; **V-g records** (Seal, Duncan), 6.10–49; **Free convection effect on fire behavior** (Scesa, Sauer), 6.10–59.

6.10–177 551.551

Dätwyler, Gottfried, **Méthode nouvelle et rapide pour obtenir l'echelle de la turbulence avec l'anémomètre à deux fils chauds.** [New rapid method for obtaining the turbulence scale with a two-hot-wire anemometer.] *Académie des Sciences, Paris, Comptes Rendus* 240(12):1312–1313, March 21, **1955.** ref. **DWB**—A new method enabling one to rapidly obtain a characteristic length of the same order as the value of turbulence scale L defined by the integral $L = \int_0 R(y)dy$, by means of varying the distance between the two parallel and identical hot wires and opposed electrically up (even) to a value y for which the determinations $\overline{(u_1 - u_2)}$ obtained would be equal to the value of turbulence $\overline{u_2}$ obtained with only one or the other of the two hot wires. *Subject Headings:* **1. Turbulence scale 2. Hot wire anemometers.**—*A.M.P.*

6.10–178 551.551:551.575:551.588.6

Hori, Jun-ichi, **On the diffusion by turbulent motion near a forest and its effect upon the apture of fogs by the forest.** *Low Temperature Science, Sapporo, Japan, Ser. A, Physical ciences,* Sapporo, Japan, 11:75-85, **1953.** 9 refs., 27 eqs. In Japanese; English summary . 84–85. **DWB**—Previously IMAHORI found (*see* 4.8–176, Aug. 1953, *MAB*) that the diffusion f fog particles by turbulent flow plays the most important role in the vanishing of advection og in the neighborhood of the fog-preventing forest. The author tried to establish a method f deriving the quantitative value for above from the characteristics of turbulent field near the oods. It was found that large turbulent eddies cannot be attributed any special predominance in capturing fog by forests. It is therefore required to define the diffusion coefficient of mall eddies which gives the measure of the contribution of these eddies to the capturing effect, nd to establish the method of calculating it from the observed characteristics of turbulent eld. It can be shown that in such cases the successive positions of floating minute particles an be treated as a stationary time series, and, applying the theory of time series, resolve it into lementary components which can be visualized as the Brownian motions of elastically bounded articles. (*See also* 5.4–183, April 1954, *MAB.*) *Subject Headings:* **1. Turbulent diffusion . Fog capture 3. Forest influences 4. Diffusion coefficient.**—*Author's abstract.*

6.10–179 551.551:681.177:519.241

Kassander, A. R. and Stewart, R. M., Jr. (*Iowa State Coll. Ames*), **Recording and automatic tabulation of continuously varying statistical data.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 19:283–292, Dec. **1952.** figs., 3 refs. **DWB**—Up to six variables are recorded on magnetic tape. An electronic device tabulates the data n nine class intervals in the form of frequency distributions for each variable or computes he correlation matrix. Block diagrams explain the operation. Although the device was eveloped for the analysis of turbulent fluctuations, it can be used also for similar problems ith continuously varying data. *Subject Headings:* **1. Electronic computers 2. Turbulent luctuations 3. Statistical techniques.**—*A.A.*

6.10–180 551.551

Obukhov, A. M., **O raspredelenii energii v spektre turbulentnogo potoka.** [Distribution f energy in the spectrum of turbulent current.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geofiz.,* No. 4/5:453–466, **1941.** fig., 9 refs., 42 eqs. German summary p. 463–466. **DLC**—The detailed mathematical development of the spectral theory of turbulence, based on RICHARDSON's theory (1922), shows that in the velocity field of a homogeneous turbulent urrent there are eddies of different scales. The dimensions of large disturbances are limited y the scale of the current itself; the size of the smallest whirls are determined by the viscosity f the medium, and small disturbances exist at the expense of the energy of the larger. The uthor introduces the idea of the spectrum of the current and of the distribution of energy in he spectrum. The function of energy distribution is determined by considerations of the alance of energy and the stability of the turbulent field. The results explain theoretically he dependence of the coefficient of exchange on the scale of observation as indicated by RICHARDSON. *Subject Headings:* **1. Atmospheric turbulence 2. Turbulence theory 3. Richrdson's criterion.**—*A.M.P.*

6.10–181 551.551:519.21

Ogura, Yoshimitsu (*Geophys. Institute, Tokyo, Univ.*), **Theoretical distribution function f matters emitted from a fixed point.** *Meteorological Society of Japan, Journal,* 2nd Ser., 2(1):22–26, Jan. **1954.** 5 refs., 18 eqs. **MH-BH**—Making use of the method of random alk, the probability law describing the distribution of matters emitted from a fixed point is heoretically determined, under the assumption that the phase angles of elementary waves rom which velocities of matter are composed take random values and are independent of each ther. The theoretical probability function thus obtained gives a good approximation. urthermore the standard deviation of matter is determined in close connection with the pectral distribution of energy of the turbulent field, in which particles are floating. *Subject Heading:* **1. Turbulence theory.**—*Author's abstract.*

6.10–182 551.551:533.6

Sandborn, Virgil A., **Preliminary experimental investigation of low-speed turbulent boundary layers in adverse pressure gradients.** *U. S. NACA, Technical Note*, 3031, Oct. **1953.** 37 p. 12 figs., 14 refs., eqs. **DWB**—Measurements of velocity profiles and skin friction in subsonic turbulent boundary layers with adverse pressure gradients are presented. The skin friction was measured by using a local heat-transfer instrument and employing a calibrated relation between heat transfer and skin friction. The skin friction in an adverse pressure gradient was found to decrease steadily with distance to a value approaching zero for the region of separation. The measured values of skin friction were related to the form factor and momentum thickness of the measured velocity profiles substantially in accordance with the equation of LUDWIEG and TILLMANN. Momentum thickness θ and mean velocity profile-form parameters H computed according to the semiempirical method of MASKELL have been compared with the measured quantities. From the agreement it is concluded that the method (which exploits the LUDWIEG-TILLMANN formula for skin friction) gives results for the flows investigated, well within a range of engineering accuracy for the predictions of profile parameters, local skin friction, and the point of flow separation; required data for the calculation are the profile parameters at a starting point and the pressure distribution. *Subject Headings:* **1. Turbulent flow 2. Boundary layer.**—*NACA abstract.*

WIND AND WIND VARIATIONS

6.10–183 551.552:551.542.1:551.515.7

Bayardelle, Maud and Roulleau, Jean, **L'angle du vent et des isobares dans les basses couches de l'atmosphère.** [The angle between wind direction and isobars in the lower layers of the atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 240(5):550–551, Jan. 31, **1955.** table, ref., eqs. **DWB**—The angle between wind direction and isobars in anticyclones over the ocean is approximately 4° at 44°N, 41°W, and 12° at 35°N, 48°W. The angle is principally dependent on wind direction. A hypothesis is advanced according to which this dependence on wind direction is due to the location of ocean currents. *Subject Headings:* **1. Anticyclones 2. Wind deviation.**—*Trans. of authors' abstract.*

6.10–184 551.552:551.588.2

†Kaps, E., **Zur Frage der Durchlüftung von Tälern im Mittelgebirge.** [On the flow of air through valleys in the Mittelgebirge.] *Meteorologische Rundschau*, 8(3/4):61–65, March/April **1955.** 6 figs., 16 refs., 9 eqs. **MH-BH**—Natural ventilation removes atmospheric pollution. Author distinguishes between foothills, middle and high mountains. The characteristics of different types of valley (U-shaped, V-shaped, open) are described. Ventilation (D) depends on width of top of valley (d), width of floor (b) and depth (t), the relation deduced being

$$D = \frac{d}{d+b} \cdot \frac{d}{t}.$$

As an example the Aschach Valley with NW or SE winds is discussed. *Subject Headings:* **1. Air flow through valleys 2. Mittelgebirge, Germany.**—*C.E.P.B.*

6.10–185 551.553.6(261,264)

*Markgraf, Hans, **Die vorherrschenden Winde auf dem Atlantischen Ozean im Januar und Juli nach Beobachtungen deutscher Schiffe aus dem Zeitraum 1925–1939.** [The prevailing winds over the Atlantic Ocean in January and July according to observations by German ships 1925–1939.] *Hamburg. Seewetteramt, Einzelveröffentlichungen*, No. 7, 1955. 6 p. 7 charts (6 in color). **DWB**—Elegant colored charts of the North and South Atlantic show the direction, force and constancy of winds in Jan. and July respectively, calms, and lines of convergence and divergence. Distribution of observations by 2° squares which comprise the basic material is shown on separate charts. *Subject Headings:* **1. Marine atlases 2. Wind frequency data 3. Atlantic Ocean.**—*M.R.*

6.10–186 551.553.8

U. S. Air Weather Service, **The occurrence of strong winds at Thule.** Its *Technical Report* 105-01, May **1952.** 8 p. fig. Photostat. **DWB**—In order to determine the conditions under which high winds, over 35 mph, prevail at Thule, all the hourly weather reports of this station over a one year period were examined. All instances with such winds were associated with wind directions from ESE and SSE, and with a similar orientation of sea-level isobars with a pressure gradient capable of producing winds of at least 10 mph. The strong wind is attributed to a combination of the airflow caused by the pressure gradient and the induced gravity flow of the cold air from the ice cap above Thule. These high velocity winds can be forecast from the direction of the surface isobars and the magnitude of the pressure gradient both of which are associated most frequently with a low approaching the station. The main paths of this low are illustrated. *Subject Headings:* **1. Strong wind analysis 2. Wind forecasting 3. Pressure gradient 4. Thule, Greenland.**—*I.L.D.*

SPECIAL WINDS

6.10–187 551.555:551.461.2

Saint-Guily, Bernard, **Sur le niveau moyen de la Côte Atlantique de l'Amérique du Nord.** [On the mean water level of the North American Atlantic coast.] *Académie des Sciences, Paris, Comptes Rendus,* 239(6):506–508, Aug. **1954.** fig., 7 eqs. **DWB**—It was shown by accurate levelings that the mean level of the North American Atlantic coast rises from Saint Augustine, Florida to Halifax, Nova Scotia. The author offers an hypothesis which would account for this variation of the mean level. The hypothesis is based on equations of mass transfer obtained by integrating the equations of motion of Atlantic circulation as determined by wind, rotation of the earth and lateral viscosity due to turbulence. *Subject Headings:* **1. Ocean-atmosphere interaction 2. Sea level variations 3. North American Atlantic Coast.**—*G.T.*

6.10–188 551.555.3

§Capello, Carlo Felice, **Osservazioni sul "pseudo-Föhn" freddo in Piedmonte. Comunicazione preliminare.** [Observations of the cold "false föhn" in Piedmont. Preliminary note.] *Società Italiana di Scienze Naturali, Milan, Atti,* 91:31–37, **1952.** tables, 2 figs. Abstracted from reprint. **DWB**—Two typical cases of "false föhn" which were noted in the Italian Piedmont (Turin) are analyzed synoptically to show the series of events which produced this phenomenon, and the consequent conditions at Turin and Superga (high altitude station). Charts and data for Nov. 24–26, 1947, and March 24–26, 1952 are presented. A third case (March 24–25, 1951) is also discussed. The false föhn is a cold, dry, violent katabatic wind, arising when NW or NE flow occurs over the Piedmont. *Subject Headings:* **1. False föhn winds 2. Föhn winds 3. Synoptic studies 4. Italian Piedmont 5. Turin, Italy.**—*M.R.*

6.10–189 551.555.6

§Rodewald, Martin, **Norder im Mexiko-Golf.** [Norther in the Gulf of Mexico.] *Wetterlotse,* 84/85:41–52, March **1955.** 6 figs. **DLC**—Description of a norther experienced on board the "Maria Weitert" on Nov. 11–13, 1954 off Tampico, with squalls up to 60 knots. Bi-hourly wind and pressure and a synoptic analysis of the situation are given. The storm began with a high over the southern states of the U. S. and a depression centered about 23°N 93°W. The cold air pushed southwest of the depression and the high pressure advanced south-westwards while the depression moved away. *Subject Headings:* **1. Northers 2. Gulf of Mexico.**—*C.E.P.B.*

WIND EFFECTS

See also: **Waco disaster** (U. S. Federal Civil Def. Adminis.), 6.10–146; **Pollen dispersal by wind** (Fedorova et al.), 6.10–248.

6.10–190 551.556.2

Uhlig, Siegfried, **Windschutzanlagen auf der Hohen Rhön.** [Wind shelter belts in the upper Rhön.] *Germany. Deutscher Wetterdienst, Mitteilungen,* No. 9, June **1954.** 17 p.

10 figs., 5 refs. **DWB**—A report on results of an investigation of the shelter belts planted in 1936 and wind velocities on the Hohe Rhön between Bischofsheim and Flandungen in Bavaria. The study, made in 1953 by the staff of the Dept. of Agricultural Meteorology of the German Weather Service, contains a description of the actual state of the plantation and of the results of very careful and elaborate wind velocity measurements (parallel and perpendicular to the belts). The usefulness of the plantation, in spite of the lack of further planting and suspension of maintenance during and after the war, is evident and the project should be renewed according to the initial plan. *Subject Headings:* **1. Shelter belts 2. Bavaria.**—*A.M.P.*

6.10–191 551.556.3:621.311.24

Studiengesellschaft Windkraft e.v., Stuttgart, **Parallelbetrieb einer 8,8 kw- Windkraftanlage mit einem Stromversorgungsnetz.** [Parallel operation of a 8.8 kw wind power installation with a power supply net.] Bericht A 2-01 der Studiengesellschaft . . . its *Mitteilungen* No. 1:1-16, April **1953.** 12 figs. (incl. photos.), 8 refs.—A report on a 6 months test of a wind power plant with wheel 10m in diameter, equipped with a 8.8 kw asynchronous generator in conjunction with a power net, is presented. The test was carried out at the experimental plant of Uhingen (Württemberg, Germany). The experimental equipment, consisting of complete wind power plant, measuring apparatus and mains connection with main lines (transformer station) and the results attained are described in detail. The recording and evaluation of the wind speed and of the electric supply (according to FERRERI) were also good. Suggestions for the improvement of the operation are outlined. *Subject Headings:* **1. Wind power stations 2. Wind utilization 3. Uhingen, Germany.**—*A.M.P.*

UPPER AIR WINDS

See also: **V-g records** (Seal, Duncan), 6.10–49; **Wind forecasting** (Durst), 6.10–102; **Causes of ionospheric winds** (Chapman), 6.10–117; **Vertical wind velocity** (Faust), 6.10–123; **Jet stream** (Due Rojo), 6.10–136; **Vertical wind distribution** (Faust), 6.10–137.

6.10–192 551.557:629.13

Cook Research Laboratories, Skokie, Illinois, **Four dimensional flight planning.** Contract AF 33(308)–23324, Atmospheric reconnaissance system studies, Interim Progress Report, No. PR 17–19, Sept. 15, **1954.** 10 p. 4 figs. **DWB**—Sample charts and instructions for their use are presented for all of the space and time (4-dimensional) distributions of meteorological parameters in one chart for use in flight planning over long distances. The forecaster or navigator can make an accurate prediction in a short time for wind effects along any flight path at any altitude for the next 24 hrs. *Subject Headings:* **1. Flight planning 2. Optimum flight paths 3. Air navigation aids.**—*M.R.*

6.10–193 551.557:551.506.7:551.513.2

Hubert, William and Dagel, Yngve (*both, Stockholm Univ.*), **Upper mean flow over the North Atlantic during January 1952.** *Tellus,* Stockholm, 7(1):111–117, Feb. **1955.** 7 figs., 13 refs. **DLC**—Three mean atmospheric cross sections, one along the eastern coast of North America near longitude 80° West, one extending from Hudson's Bay out over the western Atlantic and the third along the western coasts of Europe and North Africa for January 1952 are presented. Four distinct currents are discussed in some detail, they are: A. A polar stratospheric jet stream which is most clearly defined over Scandinavia where it shows up as a separate current centered near latitude 62°N. The maximum winds are above the 100 mb level. B. A tropospheric jet stream in middle latitudes which weakens appreciably between the eastern coast of North America and western Europe but can be traced through all three cross sections (central potential temperature about 335°A). C. A well-defined maximum over North Africa at latitude 24°N which has no clear connection with any maxima over North America and may form over the Atlantic Ocean. This current is centered at a potential temperature of approximately 345°A. D. A mean low-latitude west-wind maximum over Panama at 45,000 ft near latitude 11°N. Mean observed wind profiles at Albrook Field, Panama and at Swan Island indicate that this really is a separate current and not the south

lge of the middle-latitude jet stream. The central potential temperature in this maximum about 355°A. *Subject Headings:* **1. Jet stream 2. Cross sections 3. Wind profiles North Atlantic.**—*Authors' abstract.*

6.10–194 551.557:551.556:656.7

Marshall, J. N. and Faunce, A. B. (*R.C.A., Camden, N. J.*), **A study of the effect of winds loft on an air traffic control computer.** Camden, N. J., Radio Corporation of America [after Nov. 1947]. 8 p. 7 figs., 5 refs.—In an attempt to determine the effect of wind on aircraft approaching an airport, daily radar wind observation data obtained at Nantucket, Mass. in Jan., April, July and Oct. 1947 for altitudes of 500, 1500 and 3000 m were vectorially compared with the surface velocities. Results of the investigation are presented in graphical and tabular form and preliminary conclusions are drawn in respect to the timing of aircraft in controlled flight. *Subject Headings:* **1. Upper air winds 2. Wind effects 3. Air traffic control. I. Radio Corporation of America.**—*G.T.*

6.10–195 551.557:551.513

Winston, Jay S. (*U. S. W. B., Wash., D. C.*), **The annual course of zonal wind speed at 700 mb.** *American Meteorological Society, Bulletin*, 35(10):468–471, Dec. **1954.** 3 figs., 10 refs. **MH-BH**—The annual course of zonal wind speed at 700 mb for latitudes 20° to 70°N is portrayed in three ways—from monthly normal data, from monthly mean data averaged over a recent seven year period, and from 5-day mean data averaged over the same seven years. In a broad sense these representations have much in common, but the 5-day data reveal certain well-marked shorter period variations in the westerlies which appear to be related to singularities of the general circulation. *Subject Headings:* **1. Zonal wind profile 2. Wind speed data.**—*Author's abstract.*

6.10–196 551.557:533.16

Yerg, Donald G. (*Penna State Univ., Ionosph. Res. Lab.*), **Viscosity in the high atmosphere.** *Journal of Geophysical Research*, 60(1):87–94, March **1955.** fig., table, 10 refs., 18 eqs. **DWB**—The kinematic viscosity η/ρ approaches infinity as the density ρ approaches zero, since the results of kinetic theory show that the molecular viscosity η is independent of density. The elementary viscosity derivations use a linear velocity profile which implies near infinite streaming velocities as the density becomes small. The streaming velocities must be finite, and the velocity profile must have an upper and a lower limit in the atmosphere. It is shown that the viscous stress must approach zero with decreasing density when the velocity profile is bounded. Either the velocity gradients or the corrected viscous effect depends on a length scale representative of the wind shear and is a maximum in the lower F-region for scales comparable to those representative of the air currents studied in synoptic meteorology. *Subject Heading:* **1. Viscosity of the upper atmosphere.**—*Author's abstract.*

6.10–197 551.557.2

Jenkinson, A. F., **Average vector wind distribution of the upper air in temperate and tropical latitudes.** *Meteorological Magazine*, London, 84(995):140–147, May **1955.** 4 figs., 3 table, 27 refs., 3 eqs. **DWB**—Winds at levels up to 100 mb were computed from sea level isobars with successive vector additions of thermal winds. Between 20°N and 20°S observed winds were used. World charts are given (Mercator) of streamlines and isotachs for 200 mb for Jan., April, July and Oct. *Subject Heading:* **1. Upper air wind charts.**—*C.E.P.B.*

VERTICAL MOTION

See also: **Fronts and frontogenesis** (Sawyer), 6.10–150.

6.10–198 551.558:551.311.31

de Félice, Pierre, **Étude de la formation des rides de sable.** [Study on the formation of sand ridges.] *Académie des Sciences, Paris, Comptes Rendus*, 240(11):1253–1255, March 14, **1955.** 5 figs. **DWB**—Method and results of an investigation of the appearance,

even after moderate winds, of "ripple mark" zones (regularly spaced undulations) and sand dunes bordering on zones of smooth sand, made with 6 hot wire anemometers coupled to an oscillograph recorder, to show the difference in vertical wind distribution, are described and discussed. It has been found that: 1. The wind speed profiles vary greatly in accordance with the presence or absence of ripples. Over a smooth surface they are of the classical type over a concave toward positive values of Z—speed profiles over a surface with ripples show uniform values between 0.7 and 1.5 cm at which speed does not increase with the height. A minimum speed is even sometimes observed close to 1 cm height. 2. The amplitude of rapid variation is much greater in the case where there are no ripples. Besides that, in the case when ripples are being formed, the rapid variations have a very small amplitude above 1.5 cm. *Subject Headings:* **1. Sand dune formation 2. Vertical wind distribution.**—*A.M.P.*

6.10–199 551.558.21:629.135.

*California. Univ. at L. A. Dept. of Meteorology, **Development study of stratospheric exploratory equipment.** Contract AF 19(122)-263, Mountain Wave Project, Report No. 2. Covering work carried out by Southern California Soaring Association, Inc., first issued May 15, **1952,** rev. and reissued Oct. 31, **1952.** 111 p. 11 figs., numerous diagrs. (fold.) **DWB**—Sailplanes are more suitable for stratospheric research than balloons, thanks to controlled operations, or than powered aircraft because the time is not limited by fuel capacity and the operation is less expensive. The world sailplane altitude record (44,484′) was established by the Project. Soaring to heights up to 70,000′ is entirely possible, but would require a pressurized cabin. The main part of the report deals with the design of the cabin, with oxygen supply, location of instruments (including cosmic ray equipment) and the design of two soaring planes, which could operate under the difficult conditions encountered in mountain lee waves. *Subject Headings:* **1. Sailplane research 2. Stratospheric flights 3. Mountain wave flying.** —*A.A.*

6.10–200 551.558.21:551.507.35

California. Univ. at L. A. Dept. of Meteorology, **Mountain Wave Project.** Contract AF 19(122)-263, Report No. 3, covering work carried out by the Southern California Soaring Association, Inc. in Phase II, Oct. 1951–Oct. **1952.** 152 p. graphs, photos, tables, diagrs. Included in appendix IV: Ogawa, Hajimu, **Report on wind-tunnel calibrations of a full-scale static pressure bomb for the Southern California Soaring Association.** California Institute of Technology, Guggenheim Aeronautical Laboratory, Merrill Wind Tunnel Report, No. 11, Oct. 15, **1952.** 6 p. illus. **DWB**—Orographic waves under conditions of high altitude turbulence and in the presence of the jet stream were studied by means of sailplanes (exceeding 40,000′ height) and powered airplanes. Equipment and instrumentation are described and flight reports are given. The performance of the instruments and their calibration are discussed. *Subject Headings:* **1. Sailplane soundings 2. Mountain waves 3. Sierra Nevada I. Saudek, Victor Mead II. Eldredge, Richard Calvin III. Ogawa, Hajimu.**—*A.A.*

6.10–201 551.558.2

Garcia, Rolando V., **Straight parallel flow with curved profile.** California. Univ. at Los Angeles. Dept. of Meteorology, Contract AF 19(122)-263, Sierra Wave Project, Scientific Report, No. 5, June **1953.** 35 p. 9 figs., 4 refs., eqs. **MH-BH**—Theoretical study of the dynamic mechanism involved in the flow of air over mountains. A simple analytical solution was found for the stationary wave (L_s) in a system with hyperbolic tangent profile. It was further developed for short stability waves ($L<L_s$) and long instability waves ($L>L_s$). Both the tan.h and sinusoidal profile meet necessary specifications for the development of a neutral wave. *Subject Headings:* **1. Hydrodynamics 2. Air flow over mountains 3. Mountain waves.**—*A.A.*

6.10–202 551.558.21:797.5

Goodhart, Nicholas, **". . . Gang aft agley."** *Gliding,* 6(1):23–28, Spring **1955.** 3 figs. **DWB**—Describes a glider flight to 30,500 ft in the Sierra Wave at Bishop, Calif., on Jan. 9. *Subject Headings:* **1. Gliding 2. Sierra wave.**—*C.E.P.B.*

6.10–203 551.558.21:551.541

Rovesti, Plinio (*Instituto Argentino de Vuelo a Vela*), **Ondas atmosféricas de obstaculo: su aprovechamiento en el vuelo a vela.** [Lee waves: their utilization in soaring.] *Revista Nacional de Aeronautica*, Buenos Aires, 15(155):44–48, Feb. 1955. 15 figs. (all photos.). **DWB**—An illustrated summary of knowledge of wave phenomena in the lee of or over obstacles, beginning with the fluid dynamics experiments of LORD KELVIN and emphasizing the current investigations of the INAV Div. of Meteorology and Aerophysics, using fluids of differing density in experimental tanks, obstacles of different types and varying speed of flow. About 15 photos clearly show the structure and dynamics of stationary lee waves; the effects of plateaus and gullies; resonance phenomena with several obstacles and other obstacle effects. KUETTNER's studies of the phenomenon in nature (Riesengebirge in Germany) are also described. There (Sudeten Alps) there are parallel ranges which are analogous to the laboratory model for resonance studies (waves are reinforced or damped by resonance). *Subject Headings:* **1. Lee waves 2. Fluid dynamics models 3. Obstacle effects.**—*M.R.*

6.10–204 551.558.21:551.541

Wurtele, M. G., **Initial-value lee-wave problem for the isothermal atmosphere.** California. Univ. at L. A. Dept. of Meteorology, Contract AF 19(122)-263, Scientific Report, No. 3, June 1953. 17 p. 6 refs., eqs. **MH-BH**—The assumption of a steady state in the theoretical treatment of the lee wave in both classical and more recent papers leads to distortions, which are not verified in nature and cannot give a criterion for the existence of a lee wave. The author treats this wave as an initial problem starting with an atmosphere at rest. In contrast to the classical approach he obtains a definite solution with no singularity at infinity (amplitudes decrease with height over the mountains) and reaches a conclusion regarding the non-existence of the wave. Furthermore the process by which a steady state is established can be derived. *Subject Headings:* **1. Lee waves 2. Hydrodynamics.**—*A.A.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY AND EVAPORATION

6.10–205 551.571:537.311.3:547

Kersten, Harold (*Physics Dept., Univ. of Cincinnati*), **Humidity responsive organics.** *Science*, 121(3134):98–99, Jan. 21, 1955. fig., 4 refs. **DLC**—The relationship between the electric resistance of strips cut from thin sheets of agar, gelatin, pectin and polyvinyl alcohol and relative humidity of the surrounding atmosphere is studied experimentally. "The graph of a unit made from a half-and-half (by dry weight) of different materials is about halfway between those of the two components." Units reach equilibrium in a different relative humidity when transferred from a chamber with a constant humidity in about the same time that would be required by a hair hygrometer. *Subject Heading:* **1. Humidity effects on organic materials.**—*I.L.D.*

6.10–206 551.573

Mather, John R. and Smith, G. W., **Potential evapo-transpiration.** *Weather*, 10(7):245–246, July 1955. ref. **DWB**—MATHER, referring to the article by GARNIER and LEWIS (*see item* 6.8–276, Aug. 1955, *MAB*) emphasizes the need for more observations of potential evapotranspiration, and for a clear understanding of difference between actual and potential evapotranspiration. The latter does not depend on type of vegetation and shows water need of plants in a particular climate. The program at Centerton, N. J., is discussed. SMITH discusses calculation of evapotranspiration in Trinidad by PENMAN's method, and supports use of a grass surface as a standard. *Subject Heading:* **1. Potential evapotranspiration.**—*C.E.P.B.*

6.10–207 551.57

Uhlig, Siegfried, **Zur Bestimmung der potentiellen Verdunstung bewachsenen Boden** [Determination of potential evapotranspiration from ground covered with vegetation. *Wasserwirtschaft*, 44(12):209–315, Sept. **1954.** 8 figs., 4 tables, 9 refs. **DLC**—It was foun that potential transpiration measured from a 1m² tank with a constant water level (40–50 cr from the surface) at Eberswalde is closely related to the saturation deficit if a factor varyin seasonally from 0.54 to 0.95 is introduced. Some allowance was made for the increased wate loss due to the small size of the tank. The results were compared with methods propose by HAUDE (saturation deficit at 1400), PENMAN and THORNTHWAITE, and were found to b superior, especially considering the simplicity of the method. The seasonal march of potentia evapotranspiration is computed for a number of German stations, and a map for July alone i presented. *Subject Headings:* **1. Potential evapotranspiration 2. Lysimeter measurement 3. Saturation deficit 4. Eberswalde, Germany. I. Haude, W. II. Penman, H. I III. Thornthwaite, C. W.**—*A.A.*

6.10–208 551.573:551.491.

*Veihmeyer, F. J. and Brooks, F. A., **Measurements of cumulative evaporation from bar soil.** *American Geophysical Union, Transactions*, 35(4):601–607, Aug. **1954.** 4 figs., 5 table 4 refs. **MH-BH** —Careful measurements were made of evaporation of soil water during 192 in California at Davis, Delhi, Mountain View and Whittier. The soil surface was kept fre of vegetation and no rain fell for periods of eight to 12 weeks. Analyses of the records indicat that average curve of evaporation loss against time may be useful for situations where mor exact data are not available. Other studies of soil in tanks reveal that, after the first week the evaporation rate from bare soil without a water table is extremely slow. For a period o 1574 days during which rain was excluded, the average evaporation rate was 0.00236 in./day When water tables were maintained at depths between 0.5 and 5.0 ft it was found that th evaporation loss from uncropped soil with high water table was not directly proportional to th depth from the soil surface to the water table. *Subject Headings:* **1. Cumulative evaporatio 2. Evaporation losses 3. Water table 4. Evaporation from soil.**—*Authors' abstract.*

6.10–209 551.573:551.508.7

*Young, Arthur A. (*Soil Conservation Ser., Agri. Dept.*), **Evaporation investigations i Southern California.** A report of evaporation investigations by the Division of Irrigatio Soil Conservation Service, in cooperation with the Division of Water Resources, Departmer of Public Works, State of California. Pomona, California, April **1945.** 89 p. 11 figs 56 tables, 15 refs. Mimeo. **DWB**—Evaporation data from various types and sizes of pa in comparison with meteorological conditions are given for five years and are summarized in comprehensive study. The following coefficients for the reduction to the annual evaporatio from a 12′ pan are obtained: 1) For circular ground pans, each 3′ deep

diameter	12′	6′	4′	2′	1′
coefficient	1.00	.91	.89	.81	.66

2) For different types of pans: Bureau of Plant Industry, 0.94; Colorado pan .89; Insolate pan .82; Weather Bureau pan .77; Screened pan .98. The percent of evaporation from a ne galvanized pan varies from 83 for white color pan to 107 for an unpainted copper pa Equipment and exposures are shown in photographs. *Subject Headings:* **1. Evaporation da 2. Evaporimeter comparisons 3. Evaporation pans 4. California. I. U. S. Soil Conservatio Service II. California. Div. of Water Resources III. Blaney, Harry F.**—*A.A.*

6.10–210 551.573:551.508.7

*Young, Arthur A. (*Soil Conservation Ser., Agri. Dept.*), **Investigations of evaporation fro a screened pan and development of a coefficient for the conversion of pan evaporation to lak evaporation.** A report of evaporation investigations by the Division of Irrigation, Soil Co servation Service in cooperation with the Div. of Water Resources, Dept. of Public Work State of California. Pomona, California, Sept. **1942.** 160 p. 4 figs., 34 tables, 3 ref Mimeo. **DWB**—A careful comparison of the evaporation from 1) U. S. Weather Bureau pan 2) 12′ pans, 3) lakes and 4) a screened ground pan 2′ in diameter, 3′ deep, set in the groun

2.75′, using a screen with 4 or 6 meshes per inch, were made at 4 places in Southern California. The evaporation from the screened pan is almost the same as from 12′ pans or large bodies of water (annual reduction factor 0.98, with 4 mesh screen, and 0.99 for pans with 6 mesh screens). All data measured during several years are given with monthly summaries (evaporation, temperature, wind, rainfall, relative humidity). *Subject Headings:* **1. Evaporation data 2. Evaporation pans 3. California.**—*A.A.*

CONDENSATION

6.10–211 551.574:551.311.181

U. S. Snow, Ice and Permafrost Research Establishment, **Growth of fresh water ice** [Its *SIPRE Data Sheet*, No. 2, **1954?** 2 p. chart. **DLC**—Graph presents thickness of ice as a function of degree hours below 32°F, according to BARNES' empirical equation, assuming no snow on the ice surface. *Subject Headings:* **1. Ice accretion 2. Ice thickness.**—*A.A.*

6.10–212 551.574.1:551.588.6

Okita, Toshiichi, **Effect of model forest upon the size distribution of fog droplets.** *Low Temperature Science, Sapporo, Japan, Ser. A, Physical Sciences*, 11:29–38, **1953.** 7 figs., 3 tables, 2 refs., 4 eqs. In Japanese; English summary p. 37. **DWB**—The author made microscopic observations on the size distribution of fog droplets inside and outside a model forest at Ochiishi from July 19 to 27, 1952, to investigate the mechanism of fog dissipation by a coniferous forest. When fog droplets passed through the forest their number was decreased by evaporation and capture by trees. Evaporation effect predominated during the daytime, especially inside and behind the forest, while the effect of capture predominated during morning hours, or in case of dense fog, when the temperature rise was small and fog droplets large. In the rear of the forest the number of droplets increased with the distance from margins. Investigations of the size distribution of fog droplets in daytime show vertical change with the minimum size and amount of fog water contained per unit volume at the ground, increasing gradually with height. *Subject Headings:* **1. Forest influences 2. Fog drop size distribution 3. Fog dissipation 4. Fog capture 5. Japan.**—*Author's abstract.*

6.10–213 551.574.41:581.1

Long, I. F., **Dew and guttation.** *Weather*, 10(4):128, April **1955.** fig. **DWB**—A photograph is reproduced showing dew and guttation (exudation of water drops) which is often mistaken for it but produces larger drops. *Subject Headings:* **1. Dew formation 2. Guttation.**—*C.E.P.B.*

6.10–214 551.574.42:551.524

Gressel, W., **Über Eisbildungen an Fensterscheiben.** [Ice formations on windowpanes.] *Wetter und Leben*, Vienna, 6(5/6):128–131, Aug. **1954. MH-BH**—A description of the ice formations observed during the period Jan. 25–Feb. 4, 1953/54 in Vienna and an analysis of the immediate atmospheric conditions within the surrounding air outside and inside room on the basis of experimental observations. *Subject Headings:* **1. Ice deposits 2. Frost flowers 3. Temperature effects.**—*I.L.D.*

6.10–215 551.574.7:629.13

Bannon, J. K., **Aircraft icing at very low temperature.** *Meteorological Magazine*, London, 84(997):225, July **1955. DWB**—On a flight from Juba to Nairobi on Dec. 7, 1954, extensive CuNb at 48,000 ft gave rise to icing. Temperature was −67 to −70°C. *Subject Headings:* **1. Icing of aircraft 2. East Africa.**—*C.E.P.B.*

6.10–216 551.574.7

Iami, Ichiro, **Extraction from literature on icing.** *Researches on Snow and Ice*, Tokyo, No. 1:231–233, Oct. **1953.** 2 figs., 6 refs. In Japanese. **DWB**—Review of 6 U. S. papers on icing in clouds by LANGMUIR, HOWELL, LEWIS and others. *Subject Headings:* **1. Icing research 2. Icing in clouds 3. Cloud physics research.**—*M.R.*

FOG

See also: **Fog droplet size distribution** (Okita), 6.10–212.

6.10–217 551.575.2(436)

Hader, Fritz, **Neue Beiträge zur Kenntniss der Nebelverhältnisse Österreichs.** [New contributions to the knowledge of fog conditions in Austria.] *Geographische Gesellschaft, Vienna, Mitteilungen*, 93(7/12):130-137, **1951.** fig., 6 refs. **DLC**—Fog distribution in Austria is mapped and discussed on the basis of data for the period 1901–1950. The fogs are due to the disturbance of the lowest layer of air according to the Schneider-Carius concept. Four maps of seasonal fog distribution (normal values of days with fog with isolines from 10 to 100 days) and a map of annual fog distribution are attached. *Subject Headings:* **1. Fog distribution 2. Austria.**—*A.M.P.*

6.10–218 551.575.5:551.510.42(42)

Dukhanina, Z., **Toksicheskiĭ tuman v Londone (obzor literatury).** [Toxic fog in London: review of literature.] *Gigiena i Sanitariia*, Moscow, No. 12:35–36, Dec. **1953. DLC**—*Subject Headings:* **1. Fog, London (Dec. 1952) 2. Atmospheric pollution 3. Poison fogs 4. London, England.**

CLOUDS

See also: **Squall lines** (Brewster), 6.10–148; **Warm fronts** (Matthewman), 6.10–149.

6.10–219 551.576.1

Viaut, A., **La participation française à la nouvelle édition de l'Atlas International des Nuages.** [The French contribution to the new edition of the International Cloud Atlas.] *La Météorologie*, Paris, Ser. 4, No. 33:1–8, Jan./March **1954.** 9 figs., 4 tables. French, English and Italian summaries p. 1. **MH-BH**—The preparation for the new edition of the cloud atlas by the IMO, in particular the Committee for the Study of Clouds and Hydrometeors, is outlined and the contents of the new atlas are described. Tables showing cloud classification and hydrometeor symbols and the extent of French participation in this project are included. *Subject Headings:* **1. Cloud atlases 2. International Cloud Atlas.**—*I.L.D.*

6.10–220 551.576.11

Arch squall [in] South Atlantic Ocean [and] Arabian Sea. *Marine Observer*, 25(168)97-98, April **1955.** fig., 2 photos. **MH-BH**—1. June 13, 1954, in 27°8′S, 12°43′E, two rolls of cloud. 2. April 8, 1954, in Arabian Sea, at passage of an air mass discontinuity. *Subject Headings:* **1. Arch squall clouds 2. South Atlantic Ocean 3. Arabian Sea.**—*C.E.P.B.*

6.10–221 551.576.11

*Malkus, Joanne Starr and Scorer, R. S., **Erosion of cumulus towers.** Woods Hole Oceanographic Institution, Contract N6onr-27702(NR-082-021) Technical Report, No. 26, Jan. **1954.** 68 p. 20 figs. (incl. photos), 14 tables, 19 refs., 42 eqs. **DWB**—The various quantitative models of cumulus cloud growth are reviewed. The laws of DAVIES and TAYLOR for rise of air bubbles in liquid are used to derive a differential equation for vertical velocity as a function of time which is applicable to individual cloud bubbles. Also an erosion parameter is derived in terms of these laws which should be constant for all isolated bubbles. The erosion constant is expressed in terms of the upward velocity acceleration and buoyancy of the bubble. The theory is tested in the case of cumulus towers by simple measurements from time-lapse motion pictures and on environment temperature sounding. Observations of eleven relatively isolated cumulus bubbles selected from both trade wind regions and middle latitudes show that the erosion parameter is constant within the limits of experimental error. The applicability of the same erosion and drag laws to aggregates of several small bubbles is established. The interaction between bubbles and their environment is discussed. Data, photographs and diagrams are presented. *Subject Headings:* **1. Cumulus cloud formation 2. Cloud dissolution.**—*Based on authors' abstract.*

PRECIPITATION

See also: **Rainfall, Florida** (Florida. Div. of Water Survey . . .), 6.10–9; **Rainfall statistics, Algiers** (Dugast), 6.10–61; **Rainfall statistics** (Schneider-Carius), 6.10–63; **Precip. observations** (Germany. Met. & Hydrolog. Service), 6.10–71.

6.10-222 551.577

Ashmore, S. E., **Precipitation with clear sky.** *Meteorological Magazine*, London, 84(995): 56, May **1955.** 2 refs. **DWB**—The explanation of precipitation without visible cloud as alling from orographic cloud tied to the mountains, but carried several miles to leeward by trong winds, is not the only one. Light rain or drizzle may continue to fall after the dispersal f the cloud, with calm at the surface. *Subject Heading:* **1. Precipitation from clear sky.**—*E.P.B.*

6.10–223 551.577.2(485)

*Bergsten, F., **Neberbörden i Sverige. Medelvärden 1921–1950.** [Precipitation in Sweden: mean values for 1921–1950. *Sweden. Meteorologiska och Hydrologiska Institut, Meddelanden, Ser. C., Meteorologi*, No. 5, **1954.** 20 p. 4 tables, maps, 6 refs. English summary p. 7–8. **DWB**—The mean annual precipitation for the period 1921–1950 was calculated or all stations in Sweden that observed with screen-shielded gages during at least 10 years or the given period of record; a recomputation was carried out for those stations at which screens were not used during the entire period. Tables give mean annual precipitation data n Sweden for this period and the precipitation in Alpine districts as computed from the lischarge stations' values; also maps showing location of precipitation stations and isohyets of mean annual precipitation are given. *Subject Headings:* **1. Precipitation data 2. Sweden.**—*I.L.D.*

6.10–224 551.577(569.5)

*Jordan (Hashemite Kingdom). Dept. of Lands and Surveys, [**Rainfall and weather data record, v. 1–2**]. mostly tables. Photostat. Consists principally of a selection from its **Technical Papers,** of those entitled **Rainfall in Trans-Jordan in the Season . . .** and **Rainfall in the Hashemite Kingdom of Jordan,** covering 1937/38 through **1951/52.** Prefatory article, Smith, H. A., **The waters of the Jordan: a problem of international water control.** [signed July 1949]. **DWB**—Station names for >40 stations, their location and length of record are tabulated; then the monthly rainfall at each station, the cumulative rainfall each month and number of days with rain each month, the frequency of various intensities, the seasonal number of days and total rainfall and, finally, isohyetal maps showing various types of data as listed above, and a chart showing comparison of actual rainfall to normal for 1901–30 deduced from available records. Contents vary slightly compared with long period records at stations in Palestine. Finally, a weekly rainfall index chart and a summary for each year are presented. (*See* 4.3–219, March 1954, *MAB* for abstract of 1949–50 report.) *Subject Headings:* **1. Annual rainfall summaries 2. Precipitation variations 3. Transjordan (Hashemite Kingdom). I. Walpole, G. F.**—*M.R.*

6.10–225 551.577:551.43

Kosiba, Aleksander (*Univ. of Breslau*), **Anomalies of the precipitation sums in Silesia.** *Acta Geophysica Polonica*, Warsaw, 2(4):176–182, **1954.** 2 figs., 5 eqs. Polish summary p. 180–182. **DWB**—Mean annual and growing season precipitation data for 370 stations in Silesia for 1890–1930 are plotted against elevation of station on 2 respective charts to determine the magnitude of and location of anomalies. A different curve can be drawn for lowland than for high elevation stations. However, Schneekoppe was eliminated as being at too high an elevation, so data is limited to 0 to 1600 m range. The formulas for the linear dependence in each case are given. Large positive and negative anomalies can be grouped regionally and an explanation is attempted. *Subject Headings:* **1. Altitude effects on precipitation 2. Orographic effects on precipitation 3. Precipitation-altitude relationship 4. Silesia 5. Poland.**—*M.R.*

6.10–226 551.577(45)

*Mennella, Cristofaro, **Correlazioni pluviometriche stagionali nell'Italia peninsulare.** [Seasonal rainfall correlations on the Italian peninsula.] *Geofisica e Meteorologia*, Genoa, 2(5/6):93–97, Sept./Dec. **1954.** 2 figs., tables, 2 refs., eq. **DWB**—The annual rainfall data are divided into winter and summer data. The former received the greater amount of rainfall in Italy. Correlations between the two seasons have been calculated with particular reference to excess or deficiency in either of them. The possible application of these correlations to forecasting is considered. *Subject Headings:* **1. Precipitation data 2. Seasonal rainfall correlations 3. Italy.**—*I.L.D.*

6.10–227 551.577.2(744)

*New England Water Works Association, Boston, **Rainfall in New England; Part I, Rainfall in Massachusetts. Report of the Committee on Rainfall and Yield of Drainage Areas, Sept. 1953.** Its *Journal*, 68(1):39–92, March **1954.** almost entirely tables. **DWB**—Monthly and annual rainfall for 1942–50 and long-term averages (e.g., 115 years at Amherst, 137 years at New Bedford) for >200 stations in Massachusetts. For data during years before 1942, one must consult works of GEORGE V. WHITE and X. H. GOODNOUGH in earlier issues of the **Journal** (1915–1943). *Subject Headings:* **1. Rainfall data 2. Massachusetts.**—*M.R.*

6.10–228 551.577.36:551.577.38(944)

†*Fitzpatrick, Eugene A., **Probability analysis of rainfall factors in drought in New South Wales.** Pub. by the Rural Bank of New South Wales, in cooperation with the N.S.W. Dept. of Lands, **1953.** 54 p. 14 figs. (some fold.), 25 maps (1 fold.), 20 tables, 23 refs. **DWB**—Using BLUMENSTOCK's (BENTON'S) 1942 method of analyzing precipitation data for frequency of duration of periods between rainfalls (drought frequency), the available data for rainfall amount, frequency and duration at 60 stations in New South Wales are presented. The method has been extended by calculation of frequencies of duration of time between rainfalls of varying amounts as well as of periods of no rain. Isopleths are drawn and data presented and analyzed in detail with numerous frequency curves and charts. *Subject Headings:* **1. Drought frequency 2. Rainfall duration frequencies 3. Precipitation data analysis 4. New South Wales.**—*M.R.*

6.10–229 551.577.36(669)

*Garnier, Benjamin John, **Some comments on the rainfall at University College, Ibadan, during 1952.** *Ibadan, Nigeria. Univ. College. Dept. of Geography, Research Notes*, No. 3:15–20, May **1953.** fig., 4 tables. **DWB**—A brief analysis of the frequency of rainfalls of various amounts and of various durations and correlation of the two quantities. Also the diurnal distribution of rainfall amounts is analyzed by 4-hourly periods for each month of the year 1952. Evapotranspiration data for University College and Moor Plantation, Ibadan (and other sites in Nigeria) are also summarized in tables. *Subject Headings:* **1. Rainfall frequencies 2. Diurnal rainfall variations 3. Evapotranspiration data 4. Ibadan, Nigeria.**—*M.R.*

6.10–230 551.577.36(763)

*§Louisiana. Dept. of Public Works, **Louisiana rainfall; intensity, duration, frequency data, and depth, area and duration data.** Baton Rouge, July **1952.** 141 p. charts, graphs, tables. **DLC**—Data from 22 stations presented in tables and graphic form for use in flood control, drainage and other types of structural design and operation. Intensity-duration-frequency statistics for all storms producing 2.5 in. or more of rain in one 24 hr period or 3.0″ in 5 days or less are tabulated, with 33–43 yrs of record and a total of 3859 storms (103 to 247 per station) are analyzed. Hourly records for intense storms at 14 stations (1940–1951) are also included as well as U. S. W. B. data in maximum 24 hr rainfall for all stations with 10 yrs of record. Isohyets have *not* been drawn. *Subject Headings:* **1. Rainfall data 2. Rainfall depth duration frequencies 3. Excessive rainfall 4. Louisiana.**—*M.R.*

6.10–231 551.577.38(438) 551.573

*Schmuck, Adam, **O suszach atmosferycznych na Dolnym Śląsku.** [Drought in Lower ilesia.] *Czasopismo Geograficzne*, Warsaw, 25(1/2):95–105, **1954.** 3 figs., 3 tables, 18 refs. rench summary p. 104–105. **DLC**—In connection with the general increase of droughts uring recent years in different parts of Europe (and Poland), the author presents the results f a quantitative study of aridity in Lower Silesia during the five year period 1948–1952 based n the difference between the amount of precipitation P and the amount of evaporated water during a five day or monthly period. The daily amounts of evaporation were obtained with Wild evaporimeter at the Meteorological and Climatological Observatory of Wroclaw Breslau) University. A pentad was considered to be dry when $Ep > 5Ed + P_p$ where E_p the amount of evaporated water; E_d—its mean daily amount; and P_p—the precipitation. ame formula was used for monthly periods. The results of the study, presented in figures nd tables, give a picture of the frequency, the exact time and duration of pentads and of nonths of intensive or moderate atmospheric dryness during the 5 year period investigated. *ubject Headings:* **1. Drought 2. Aridity 3. Precipitation-evaporation ($P-E$) 4. Lower ilesia, Poland.**—*A.M.P.*

RAIN AND SNOW

See also: **Snow cover, climate, Sierra Nevada** (Miller), 6.10–8; **Problems in modern weather service** (Scherhag), 6.10–101; **Chemical climate** (Rossby, Egnér), 6.10–111.

6.10–232 551.578.11

†Teichert, F. and Greifenhagen, B. (*Dresden-Wahnsdorf, Met. Obs.*), **Physikalisch-hemische Regenwasseruntersuchung.** [Physico-chemical investigation of rainwater.] *eitschrift für Meteorologie*, Berlin, 8(9):275–281, Sept. **1954.** 33 refs. **MH-BH**—The nportance of rainwater analysis in determining the chemical composition of atmospheric ayers and to agriculture is considered and the various methods used to study the physical hemical characteristics of rainwater are described. These methods involve the determination f turbidity, fluorescence, pH value and chlorine, sulfate, ammonia and nitrite content and rganic substances. *Subject Headings:* **1. Rainfall composition 2. Chemical analysis of ainfall.**—*I.L.D.*

6.10–233 551.578.41

Blowers, K. E., **Ice needles at Ipswich.** *Meteorological Magazine*, London, 84(997):224–25, July **1955.** fig. **DWB**—Description of a fall of ice needles on Feb. 24, 1955. *Subject leading:* **1. Ice needles.**—*C.E.P.B.*

6.10–234 551.578.46:796

Huzioka, Tosio, **Studies on ski, Pt. 1, The force with which the foot of a skier pushes he ski forward.** *Low Temperature Science, Sapporo, Japan, Ser. A., Physical Sciences*, 2:37–49, **1954.** 4 figs., table, 7 refs., 3 eqs. In Japanese; English summary p. 49. Also: Yoshida, Zyungo, Pt. 2, **Theoretical studies on the resistance of skis.** *Ibid.*, p. 51–60. 3 figs., refs., eqs. Eng. summary p. 59–60. **DWB**—Instruments registering automatically the orce with which the foot of a skier pushed forward the ski were attached to each of the skis nd measurements were made on the ski-field. It was observed that not only did the force ot have the same mean values on each one of the skis but also that extensive fluctuations ere superposed on the mean values. The fluctuations were greater on the ski that showed the arger mean force value. The mechanism of the fluctuations is attributed not to the frictional orce between snow and ski, but to the breakdown of snow under the pressure exerted by the ki. In the continuation of the first study, the author undertakes a further theoretical analysis f the forces operating on the skier's foot during skiing. It is found that in order to prevent he body of the skier from turning as a result of the unequal forces on his feet there must riginate counter forces presumably from small deviations of the skis from the direct advancing irection of the skier. A small difference between the weight of the skier acting on each of the kis was effective enough to produce deviations of the directions of the ski so that the resistance o the skis was increased considerably. *Subject Headings:* **1. Snow mechanics 2. Skiing.**—*Based on authors' abstracts.*

6.10–235 551.578.46

Landauer, Joseph K., **Stress-strain relations in snow under uniaxial compression.** *U. S. Snow, Ice and Permafrost Research Establishment, Research Paper*, No. 12, Feb. **1955.** 9 p. 8 figs., table, 13 eqs. **DWB**—This paper contains a summary of work done during the past year on the uniaxial compression of snow. Two types of tests were performed; experiments at constant specific velocity and tests at constant load. The visco-plastic behavior of snow is correlated with density, temperature, stress, and snow type. It is found that rate of deformation can be represented by $v = f_1(\epsilon) \cdot f_2(K) \cdot f_3(\sigma) \cdot f_4(t)$, where $f_1(\epsilon)$ and $f_2(K)$ are functions of void ratio and absolute temperature, respectively, and are similar for constant velocity and constant load tests. $f_3(\sigma)$ is a function of stress which is linear for low stress but increases to an approximately cubic relationship for higher stresses. $f_4(t)$ is a function of time which is only important for creep tests. The effect of snow type is small, being less than the relatively large experimental errors encountered. *Subject Headings:* **1. Snow physics 2. Snow mechanics 3. Snow properties.**—*Author's abstract.*

6.10–236 551.578.46:551.509.6

Rikhter, G. D., **Snezhnyĭ pokrov i ego rol' v narodnom khoziaĭstve.** [Snow cover and its role in national economy.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr.*, No. 3:42–49, **1954.** 12 refs. For shorter version, *see Priroda*, Moscow, 43(11):24–32, Nov. **1954.** photos, refs. **DLC.** Trans. of latter into Czech as: **Sněhová pokrúvka a její úloha v národním hospodářství.** *Meteorologické Zpravy*, Prague, 8(2):53–56, April 30, **1955.** 10 refs. **DWB**—The significance of snow cover for agriculture and practical methods of improving growing conditions and of increasing the yield of plants by appropriate measures are stressed. They are: the regulation of the temperature regime of soils under snow cover by increasing or diminishing its thickness, or changing its density and heat conductivity; the accumulation or redistribution of winter supplies of moisture and the regulation of the duration of snow cover. Discusses the methods of prevention of snow drifts and blocking of railroads and highways and the struggle against landslides and avalanches. Finally, the significance of snow in home and factory building and other problems of snow and snow cover are taken up. *Subject Headings:* **1. Snow cover studies 2. Soil temperature under snow 3. Snow drift prevention 4. Artificial influences 5. U.S.S.R. I. Spirhanzl, Jaroslav** (*trans.*).—*A.M.P.*

6.10–237 551.578.46

*Villeneuve, G. Oscar (*Met. Bureau, Quebec*), **L'enneigement du Québec.** [Snow depth in Quebec.] *Quebec (Province). Bureau de Météorologie, Bulletin*, No. 26, **1954.** 22 p. 3 diagrs., 15 tables, 5 refs. English trans. issued as its *Bulletin*, No. 26-A, **1954.** 22 p. **DWB**—Average snowfall amounts and accumulated snow cover depths are presented for each month (Oct.–April) of the period 1941–1953 for four stations in the Province of Quebec and for Burlington, Vt., Concord, N. H. and Albany, N. Y. Comparative curves of snowfall and snow cover depth Quebec vs. New England are also presented. The study was prepared to confirm the choice of skiers who are attracted to the snow fields of Quebec. *Subject Headings:* **1. Snow cover data 2. Quebec, Canada.**—*G.T.*

6.10–238 551.578.7

Feteris, P. J., **£330,000 hail damage in fifteen minutes, analysis of a devastating hailstorm.** *Weather*, 10(7):223–232, July **1955.** 5 figs., photo, 7 refs. **DWB**—On June 19, 1954 a cold front lay over the North Sea with widespread thunderstorms in warm air to east and wet adiabatic lapse 700–250 mb. Violent hailstorms raged over southern Zeeland in the Netherlands. In Zuid Beveland size distribution, time and duration of hail and accompanying lightning are plotted. In the central belt 6–4 km wide hailstones were as large as hens' eggs (30–60 mm). Storms also occurred in Groningen and Friesland. Causes of different types of hail, and their distribution in the storm, are discussed. Transparent hail was due to coalescence of about 60 large half-frozen drops. Updraught is estimated as 10–20 m/s. Prevention of storms by overseeding would be possible but very difficult. *Subject Headings:* **1. Hail damage 2. Hailstorm size 3. Hailstorms 4. Netherlands.**—*C.E.P.B*

HYDROMETEOROLOGY

See also: **Flood frequency** (Am. Soc. Civil Engineers), 6.10–108.

6.10–239 551.579:551.509.54

***British Columbia snow survey bulletin for Columbia and Fraser Basins in British Columbia nd lower coastal areas.** First issue seen, April 1941— Latest issue seen, Feb. 1, 1955. Ionthly (irreg.). numerous tables. Issued by Water Rights Branch, Dept. of Lands and orests, British Columbia. Title varies: **Snow surveys and run-off probabilities for that part f British Columbia . . . ;** also **British Columbia snow surveys for Columbia Basin in B.C. . . ;** also **British Columbia snow surveys and run-off forecasts for Columbia Basin in B.C. . . DLC**—Forecast of average water content of snow pack for Columbia, Kootenay, kanagan-Similkameen, Fraser, North Thompson and Skagit river basins in 1955 as compared ith normal 1954 and 1953 snow pack, is presented in table. Actual survey data for many oints in these basins are also presented in table based on Jan. 31, 1955 samples. Map shows ocation of stations and courses in British Columbia. *Subject Headings:* **1. Snow runoff fore- asts 2. Snow survey data 3. British Columbia. I. British Columbia. Dept. of Lands and orests.**—*M.R.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATE OF PARTICULAR PLACES

See also: **Snow cover, climate, Sierra Nevada** (Miller), 6.10–8; **Temp. climate classification** (Miller), 6.10–256.

6.10–240 551.582.2(794)

*Farnham, Donald L.; Vercy, Isabelle C. and Dalton, Quentin S., **An analysis of atmospheric data at the Naval Ordnance Test Station, Inyokern, California.** *U. S. Naval Ordnance Test Station, Inyokern, Calif., NAVORD Report,* No. 3391, NOTS 973, Jan. 15, **1955.** 50 p. figs., 7 tables (1 fold.), 16 refs. **DWB**—All available surface and upper air meteorological ata for the Naval Ordnance Test Station, Inyokern, Calif. from 1946 through 1953 are resented in analytical form and discussed. Geographic and topographic influences, location f instruments, pressure, temperature, sun and sky radiation intensity, cloudiness, relative umidity, precipitation, wind, visibility; upper air winds, pressure, temperature, relative umidity to 55,000 ft, tropopause height, degree days and dust storms, etc. are considered. verage precipitation is 1.98 in.; extreme temperature ranges from 3°F to 114°F have been ecorded in area. *Subject Headings:* **1. Climate of Inyokern, Calif. 2. Solar radiation data Tropopause height data 4. Upper air data 5. Inyokern, Calif.**—*M.R.*

6.10–241 551.582.2(51,52)

*Japan. Central Meteorological Observatory, Tokyo, **Climatic records of Japan and the ar East area. Air pressure, air temperature, amount of precipitation.** June **1954.** 679 p. lmost entirely tables. In Japanese and English. Revision of two previous volumes, each ntitled, **Climatic records of Japan,** pub. 1906 and 1929. **DWB**—Complete monthly and nnual means of pressure, temperature and precipitation from beginning of record through 952 (where available) for Japan, Kuriles, Sakhalin, Korea, Manchuria, China, Formosa, ne Bonin Islands and Japanese Mandate Islands in W. Pacific. Contains data for many tations not in World Weather Records. Station names are in English or in romanized apanese (Hepburn system). List of 400 stations gives coordinates and alternative names f some of the stations. Tokyo record is complete for 1876–1952. *Subject Headings:* **1. Cli- natic data 2. Climate of Japan 3. Japan 4. Far East. I. Wadati, Kiyoo II. Saito, Ren- hi** (*comp.*).—*M.R.*

6.10–242 551.582.3(82)

Argentina. Dirección General de Navegación e Hidrografiá, **Atlas evoluciones tipo del empo.** [Atlas of weather type development.] **1944.** 78 charts (in color). **DWB**—The

synoptic charts presented in this atlas illustrate a number of weather types which are common along the southern (Patagonian) and the northern coasts of Argentina. Fronts and isallobars as well as isobars are portrayed on each chart. Temperatures, winds and weather are also indicated in different colors. The charts are beautifully drawn and reproduced, and indicate what season each is typical of, but the actual date of each chart is not given so one does not know if they are actual or compiled charts (they give the impression of being actual cases). Cyclones, anticyclones, cold and warm fronts and occlusions are all illustrated. *Subject Headings:* **1. Weather types 2. Argentina.**—*M.R.*

CLIMATIC CHANGES

6.10–243 551.583

†Brooks, C. E. P., **Present position of theories of climatic change.** *Meteorological Magazine*, London, 84(997):204–206, July **1955.** 19 refs. **DWB**—Recent literature on the causes of climatic change is discussed. Variations of solar radiation are now first favorite but the problem is still unsolved. *Subject Heading:* **1. Climatic change theories.**—*C.E.P.B.*

6.10–244 551.583:581.056

Douglass, Andrew Ellicott, **Researches in dendrochronology.** *Utah. Univ., Bulletin*, No. 2, July 12, **1946;** its *Biological Series*, 10(1), **1946.** 19 p. 17 figs. (incl. photos.), refs. **DWB**—The author reports on his extensive research on cyclical evidence from tree ring data, which might be of value in forecasting. The climatic evidence which may be obtained from cross-dating, especially in marginal areas where tree growth is limited by water deficiencies, is supported by rainfall records for period 1870–1910 (illustrations in correlation with tree growth records). An ingenious mechanical cycloscope built in 1936 which makes rapid visual determinations for tree ring cycle analysis possible, the length of climatic record obtainable by tree ring analysis (nearly 2000 years), solar influences and, finally, the usefulness of cyclical and statistical research and forecasting are discussed and illustrated. *Subject Headings:* **1. Dendrochronology 2. Tree ring growth.**—*M.R.*

6.10–245 551.583:551.311.18(261)

*†Maksimov, I. V., **Vekovye kolebaniia ledovitosti severnoĭ chasti Atlanticheskogo okeana.** [Secular fluctuations of ice conditions in the northern Atlantic Ocean.] *Akademiia Nauk SSSR. Institut Okeanologii, Trudy*, 8:41–91, **1954.** 34 figs., 10 tables, 34 refs. **DLC**—In this comprehensive study the author discusses the secular fluctuations of ice conditions in the North Atlantic Ocean, the causes of the 18-yr fluctuation, changes in the time of the 18-yr cycle of the mean solar constant, two- and three-hundred year fluctuations of ice conditions in the North Atlantic and the causes of the climatic changes occurring in Europe during the present century. *Subject Headings:* **1. Climatic variations 2. Sea ice variations 3. North Atlantic.**—*I.L.D.*

6.10–246 551.583.15:551.513.7(46)

Dué Rojo, Antonio, **Sobre algunas recientes anomalías climatológicas.** [Some recent climatological anomalies.] *Urania*, Barcelona, 39(237):129–135, April/June **1954.** 2 figs. **DWB.** Also reprinted as: *Granada. Observatorio de Cartuja, Trabajos Científicos*, Ser. B, 8(65), **1954.** 5 p. 2 figs. **DWB**—In this account of some climatological anomalies recorded at the Cartuja Observatory in 1953 as compared with 1902–1952 period of record, the author discusses: 1) the unusual winter and spring rianfall deficit in 1953, 2) intense winter cold and 3) summer hot spells. The relationship of these phenomena to the general circulation is discussed. *Subject Headings:* **1. Climatic anomalies 2. Atmospheric circulation 3. Cartuja Observatory, Barcelona.**—*I.L.D.*

6.10–247 551.583.2:539.16:581.056

Craig, Harmon (*Inst. for Nuclear Studies, Univ. of Chicago*), **Carbon-13 variations in sequoia rings and the atmosphere.** *Science*, 119(3083):141–143, Jan. 29, **1954.** fig., 13 refs., foot-ref. **DLC**—An analysis of C^{13} content of a *Sequoia Gigantea* for 2500 years (900 B.C. to

500 A.D.) shows that C^{13} remained constant to at least 1 per mil., with a change in mean composition of <0.2 per mil. These variations are more likely due to varying assimilation and respiratory processes than to atmospheric changes. At best these variations are minute in comparison with 4.5% variations in nature. Large variations did occur in some centuries (especially in the early years of the growth of the trees), but these did not affect the secular trend and may be due to plant growth factors. *Subject Headings:* **1. Climatic changes 2. Carbon-13 variations 3. Dendrochronology 4. Radiocarbon dating.**—*M.R.*

6.10–248 551.583.3:581.16 551.556.4:581.16

*†Fedorova, R. V., **Kolichestvennye zakonomernosti v rasprostranenii vetrom pyl'tsy duba.** [Quantitative regularities in the amount of oak pollen spread by wind.] *Akademiia Nauk SSSR. Institut Geografii, Trudy*, 46:203–255, **1950.** 25 figs., 10 tables, 21 refs. Brichuk, A. P., **Rastitel'nost' Russkoĭ ravniny v nizhne- i srednechetvertichnoe vremia.** [Vegetation of the Great Russian plain in Lower and Middle Quaternary time.] *Ibid.*, p. 5–202, bibliog. p. 198–202. Mal'gina, E. A., **Opyt sopostavleniia rasprostraneniia pyl'tsy nekotorykh drevesnykh porod s ikh arealami v predelakh Evropeĭskoĭ chasti SSSR.** [Comparison of pollen distribution of some woody species with their areal expansion over European U.S.S.R.] *Ibid.*, p. 256–270, bibliog. p. 269–270. Monoszon, M. Kh, **Opisanie pyl'tsy vidov polyneĭ, proizrastaiushchikh na teritorii SSSR (dlia tseleĭ pyl'tsevogo analiza).** [Notes on pollen in varieties of wormwood growing in the U.S.S.R.] *Ibid.*, p. 271–358, bibliog. p. 360. **DLC**—This volume contains an enormous amount of quantitative data in the form of graphs, tables and charts, summarizing and analyzing the results of pollen analyses made in all parts of the U.S.S.R., Central Europe and Scandinavia. In the first named article wind roses are constructed for each site, showing direction and extent of dispersal in each of 8 directions for each location. In the other articles spread of species of oak, pine, etc. are shown and interpreted in terms of climatic changes in various geological periods. Methods are treated in detail, and extensive coverage of literature on subject given for each article. *Subject Headings:* **1. Pollen analysis 2. Pollen dispersal by wind 3. Aerobiology 4. Quaternary climates 5. U.S.S.R.**—*M.R.*

6.10–249 551.583.3:551.79(64)

†Mensching, Horst, **Das Quartär in den Ġebirgen Marokkos. Geomorphologische Untersuchungen zusammengestellt zu einem Profil vom Mittelmeer zur Sahara.** [The Quaternary of the mountains of Morocco. Geomorphological investigations summarized in a profile from the Mediterranean to the Sahara.] *Petermanns Geographische Mitteilungen, Ergänzungsheft*, No. 256, **1955.** 27 figs., 3 charts, 46 refs. **DLC**—A number of journeys were made to study the glacial and pluvial climate in the Pleistocene compared with the present. Pt. A describes investigations in the several plateaus and mountain massifs and the distribution of red earth. In Pt. B these are collected in two N–S profiles, for the continental region of E. Morocco and for the Atlantic littoral. These show the pluvial and present snow lines and levels of effective solifluction. In the pluvials both were lowered by about 1000 m compared with present, indicating a temperature lower by 4–5°C on Mediterranean coast and 3–4°C on edge of dry zone in south. The glaciations of the Central and High Atlas were represented in the Riff by pluvial periods and firn fields. The tree line only encroached a little on the desert steppe, showing only a moderate increase of rainfall. The west sides of the mountains were rainier than the east. *Subject Headings:* **1. Quaternary climates 2. Morocco.**—*C.E.P.B.*

MICROMETEOROLOGY

See also: **Snow cover and climate in the Sierra Nevada, Calif.** (Miller), 6.10–8

6.10–250 551.584 551.586:634.9(411)

Green, F. H. W., **Climatological work in the Nature Conservancy.** *Weather*, 10(7):233–236, July **1955.** fig., 5 refs. **DWB**—Microclimatic research included study of ant populations in Dunbartonshire, and light intensity and size of raindrops under tree canopies. Effect of microclimate on regeneration of forests was studied in Scotland. Distribution of "maritimeness" with height and distance from Atlantic is illustrated. *Subject Headings:* **1. Bioclimatology 2. Forestry 3. Microclimatology 4. Scotland.**—*C.E.P.B.*

6.10–251 551.584:631.

Sato, S. (*Kyushu Agric. Experiment Station*), **Microclimatic studies on some methods o irrigation in the rice-field (4).** *Journal of Agricultural Meteorology*, Tokyo, 9(1):11–12 Dec. **1954.** 2 figs., table. In Japanese; English summary p. 12. **MH-BH**—In the lowlan district of Kyushu the climate is almost subtropical in the summer season. For paddy rice low field-temperature obtained by continuous irrigation with running water is more favorab than high temperature obtained with stagnant water. At the beginning of running-wate irrigation, the soil temperature instantly follows the water temperature and becomes lowe it continues lower for approximately a week after the irrigation is stopped, which is not th case with stagnant water. Accordingly running-water irrigation should be ended a few day before the artificial control of temperature becomes unnecessary. (For Report 3, *see* 3.10–27 Oct. 1952, *MAB.*) *Subject Headings:* **1. Microclimate of fields 2. Irrigation 3. Rice cultur** —*Author's abstract.*

CLIMATIC CLASSIFICATION

See also: **Climatic classification** (Knock, Schulz), 6.10–11; **Arid zone research** (UNESCO), 6.10–16.

6.10–252 551.585(47

Antonov, V. S., **O klimaticheskom raïonirovanii Tuvy.** [Climatic regionalization o Tuva.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(6):522–537, Nov./Dec. 195 fig., 10 refs. **DLC**—The author describes the general characteristics of the climate of Tuva in particular the temperature and wind characteristics, and then gives a detailed account o regional climates with particular reference to the dependence of climate upon relief. Seve climatic regions are established and they are shown on a map. These climatic regions are the western valley steppe zone, eastern valley steppe zone, forest steppe zone of the north western ridges and mountains, the mountain rock steppes of the southern mountain slope the desert steppe zone of the Ukra-Nur basin, the mountain forest zone and the high mountai zone. *Subject Headings:* **1. Climatic classifications 2. Climate of Tuva 3. Tuva, Asiati U.S.S.R.**—*I.L.D.*

6.10–253 551.58

Azzi, Girolamo (*Perugia Univ.*), **Il concetto di clima assoluto.** [Concept of absolut climate.] *Geofisica e Meteorologia*, Genoa, 2(1/2):3–4, Jan./April **1954.** fig., tables, eq **DWB**—The principle of absolute climate, as defined by the author, is based on two funda mental parameters—annual mean precipitation and annual mean temperature. He utiliz this concept to obtain a complete picture of the climate of the earth which he divides into fou natural climatic types. From the over-all view he arrives at the climate of each particula place. The proportion of the earth's surface that is represented by above and below averag temperature and precipitation is shown by a square divided into four unequal parts accordin to the above criterion. *Subject Heading:* **1. Climatic classifications.**—*L. Piermarini* and *M.*

6.10–254 551.585(51

Chu, Coching, **Climatic provinces of China.** *Academia Sinica, Institute of Meteorology Memoir*, No. 1, **1931.** 11 p. 8 plates, 18 refs. **DLC**—Eight major climatic provinces ar recognized: 1) South China type, 2) Central China or Yangtze Valley type, 3) North Chin type, 4) Manchurian type, 5) Yunnan plateau type, 6) Steppe type, 7) Tibetan type (heigh over 3000 m) and 8) Mongolian type. Climatic provinces of China according to KÖPPEN an DE MARTONNE as well as the above scheme are shown on many colored charts; isohyetal an isothermal charts are also presented. *Subject Headings:* **1. Climate of China 2. Climati classifications 3. China.**—*H. Arakawa.*

6.10–255 551.585:581(69

Koch-Isenburg, Ludwig, **Madagaskar—das heutige Gesicht der grossen Insel. Lands schaft und Klimazonen.** [Madagascar. The present aspect of the great island: landscap and climatic zones.] *Umschau*, 55(14):433–435, July 15, **1955.** 7 figs. **DLC**—The climat

nes are: 1) windward on the east, rainy, marshy and fruitful, temperature 20–35°C; 2) lee-ard, dry forest and secondary steppe, temperature 10–47°C, rainfall about 900 mm; 3) plateau, ealthy, at Tananarive (1400 m) 14–25°C and 1200 mm; 4) southern tip, thorn forest, climate treme, semidesert. Typical landscapes are shown. *Subject Headings:* **1. Climatic types Vegetation zones 3. Madagascar.**—*C.E.P.B.*

6.10–256 551.585:551.582.3

Miller, A. Austin, **The importance of 43°F (6°C) in the classification of temperature imates and in the definition of major geographical regions.** *International Geographical ongress, 17th, Wash., D. C., Aug. 8–15, 1952, Proceedings*, p. 32–36, [1952?] **DLC**—Climatic gions, for geographical purposes, are defined by the number of months with average tem-erature above 6°C, which is assumed as the necessary minimum for the growth of vegetation. o month above 6°C—ice climate; 1–2 months—arctic climate; 3–5 months—cold climate; -11 months—cool temperate climate, all months above 6°C—warm temperate (or sub-opical) climate. A world map is printed in the *Institute of British Geographers, London, ransactions and Papers, 1951*, p. 15–20 (*see item* 5.2–252, Feb. 1954, *MAB*). *Subject Headings:* **Climatic classifications 2. Plant climatology.**—*A.A.*

6.10–257 551.585:631.48

Schaufelberger, Paul, **Eignen sich die Regenfaktoren Langs zur exakten Klassifikation er tropischen Böden?** [Are Lang's rain factors suitable for the exact classification of tropical ils?] *Petermanns Geographische Mitteilungen*, 99(2):99–106, **1955.** 6 tables, 9 refs. **DLC**—pinions, favorable and unfavorable, of LANG's factors are summarized. Author then con-ders a number of soil profiles at tropical stations of known rainfall and temperature and mpares them with soils expected on LANG's system. The question of laterite is discussed; is regarded as a rock formation, often underground, and not a soil dependent on present imate. *Subject Headings:* **1. Climatic classifications 2. Soil types. I. Lang, R.**—*C.E.P.B.*

6.10–258 551.585.53(611)

*Clarke, John I., **Summer nomadism in Tunisia.** *Economic Geography*, Worcester, Mass., (2):157–167, April **1955.** 9 figs., table. **DWB**—During extended periods of drought (2 or years), a third of a million semi-nomadic sheep herders leave the pasture regions of Tunisia nd seek employment in the cooler and more moist areas where grain and olives are grown. his is a far greater migration than the normal summer migration to high green pastures and ack to the warm lowlands in winter. Tabulated rainfall for Metlaoui for 1946–1950 shows treme month-to-month and year-to-year variability during drought years (1946–48). ormal for 1901–50 is 137 mm per year (<6 in.). Charts show isohyets, relief, vegetation pes, livestock and crop fluctuations, lines of potential evapotranspiration and moisture gions based on THORNTHWAITE's 1948 classification (ranging from humid [>100] to arid −60 to −40]). *Subject Headings:* **1. Climate of Tunisia 2. Drought and migrations Metlaoui, Tunisia.**—*M.R.*

BIOCLIMATOLOGY

See also: **Climatological work in nature** (Green), 6.10–250.

6.10–259 551.586:572

Topitz, A., **Die Rhythmushypothese, ein neuer Gedanke zur Beziehung des Menschen u Klima und Witterung.** [The rhythm hypothesis, a new idea of man's relation to climate nd weather.] *Wetter und Leben*, 6(3/4):66–70, June **1954. MH-BH**—The rhythm hy-othesis maintains that the internal 24-hour vital rhythm is inherited but its manifestation elicited by environmental stimuli after birth. The theoretical physiological basis of the ternal vital rhythm, the relationship of the vegetative nervous system to the daily tem-erature rhythm, HELLPACH's ideas on the stimulating role of continental climates, the possible lationship between stature and climate, and the importance of climatic stimuli are discussed. *ubject Headings:* **1. Human ecology 2. Climatic influences.**—*I.L.D.*

6.10–260 551.586:572

Topitz, A., **Zum Einfluss des Lufdruckes auf den Menschen.** [The influence of at mospheric pressure on man.] *Wetter und Leben*, Vienna, 6(7/9):168–169, **1954. MH-BH**— The author reports the results of experiments, carried out in pressure chambers, on the effec of pressure changes upon body colloids. An increase of atmospheric pressure by a third produced a feeling of euphoria and a slight rise in axial temperature. On the other hand muscular exercise, such as weight lifting was rendered difficult, indicating according to the author, a diminution of blood viscosity. *Subject Headings:* **1. Human ecology 2. Pressure effects.**—*I.L.D.*

6.10–261 551.586:636.2

Hermosura, S. R. (*Univ. of the Philippines*) and Manangan, Ignacio, **Preliminary study of the heat tolerance of three different breeds of dairy cows imported into the Philippines.** *Natural and Applied Science Bulletin*, Manila, Quezon City, 12(3):199–210, July/Sept. 1952 4 tables, 7 refs. **DLC**—Some of the recent literature on the effect of high atmospheric tem perature upon cattle is reviewed. The results of experiments in which 5 Holstein, 5 Jersey and 5 Sahiwal were exposed to the heat of the sun and the pulse and respiration rates and temperature were measured are presented. They show that the degree of heat tolerance is highest among the Sahiwal cows and lowest among the Holsteins. *Subject Headings:* **1. Heat tolerance 2. Temperature effects on cattle 3. Animal ecology 4. Philippine Islands** —*I.L.D.*

6.10–262 551.586:612

Fabricant, Noah D., **Weather and well-being.** Off-set reproduction from unidentified source, Jan. **1955.** p. 32–33, 51. **DWB**—General discussion of how weather affects health psychological and physiological reactions to changes in heat, cold, sunshine or cloudiness and to changes suffered while going outdoors from heated homes. *Subject Headings:* **1. Weather sensitivity 2. Biometeorology.**—*M.R.*

6.10–263 551.586:612.39

†Sargent, Frederick, II (*Univ. of Ill.*), **Season and the metabolism of fat and carbohydrate a study of vestigial physiology.** *Meteorological Monographs*, Boston, 2(8):68–80, Oct. 1954 5 figs., 5 tables, 90 refs. **MH-BH**—The author presents a critical review of the literature on the seasonal variation in the metabolism of fat and carbohydrates with special reference to the theory of E. HUGHES that seasonal variations in physiological processes and metabolic diseases are attributable to a vestigial physiological mechanism that is similar to hibernation in lower animals. The physiological evidence for this hypothesis includes the seasonal growth of children, the seasonal variation in the intake of carbohydrates and fat, seasonal variation in the metabolism of fats, ketones, in glycogen formation and storage, and the seasonal exacerbation of the symptoms of diabetes mellitus. *Subject Headings:* **1. Bioclimatology 2. Physiology of nutrition.**—*I.L.D.*

6.10–264 551.586:633.1

Nakahara, Magokichi; Tahara, Toraji and Nakazawa, Soichi, **The wheat growth and the baido condition, pt. 2.** *Journal of Agricultural Meteorology*, Tokyo, 9(3/4):85–87, Aug **1954.** 2 figs., 2 tables, 2 refs. In Japanese; English summary p. 87. **DWB**—We have made further experiments after our previous one in 1952 on lots shown in Fig. 1 in order to test the significant difference of baido types and the frequency of baido operations with special reference to the manure conditions. The soil temperatures were observed once a day at 10 h every morning as in the former experiments. The difference of the soil condition during the cold season can be seen among these farm plots, but there is no significant amount of variation in the grain yields by use of the lot as in 1952, except that the influence of manure condition is seen. *Subject Headings:* **1. Wheat ecology 2. Fertilizer effects 3. Soil temperatures.**— *Authors' abstract.*

6.10–265 551.586:636.2(213)

†*Bruyère, P., **De l'adaptation des bovins aux climats chauds.** [Adaptation of cattle warm climates.] *Belgium. Direction Générale de l'Agriculture. Bulletin Agricole du ongo Belge*, 45(4):1057–1083, Aug. **1954.** tables, figs., 52 refs. **DWB.** Reprinted from *nnales de Medicine Vétérinaire*, Brussels, No. 4, **1953.**—In this extensive review of the liter- ture of the past fifteen years on the adaptation of cattle to warm climates, the author discusses he following: influence of atmospheric temperature upon the behavior of animals, upon the ody temperature and upon the respiratory and cardiac rhythms, heat regulation, influence of at color, heat tolerance, comparison of heat tolerance of Jersey and Holstein breeds, effect shade and sprinkling upon heat tolerance and respiratory and cardiac rhythms, variation heat tolerance with age, the inheritance of heat tolerance, the effect of temperature on rtility, milk yield, beef production and growth. *Subject Headings:* **1. Temperature effects n cattle 2. Acclimatization 3. Tropical bioclimatology.**—*I.L.D.*

6.10–266 551.586:638.4(676)

Davies, D. A., **A comparison of the climate of the Orissa-Bihar District of India with that East Africa with particular reference to requirements of the Lac insect.** *East Africa High ommission, Meteorological Department, Memoirs*, 2(6), **1950.** 6 p. tables, chart. **DWB**— Ionthly averages of air temperature, rainfall, relative humidity and cloud amount for the ations Ranchi and Charibasa in the Orissa-Bihar district in India, and for Moshi and Sonega eas in East Africa are given. The suitability of the climate of East Africa for the intro- uction of the Lac insect is discussed. *Subject Headings:* **1. Climate and insects 2. Climatic nalogs 3. East Africa 4. Orissa Bihar District, India.**—*I.L.D.*

6.10–267 551.586:91.04(213)

Grober, Julius, **Triennium Bioclimaticum Tropicale (TBT) II.** [Three-year study period tropical bioclimatology II.] *Forschungen und Fortschritte*, 29(6):169–172, June **1955. LC**—Author develops his plan for a 3-year international investigation of tropical life and ving by a Committee under the auspices of UNESCO. The plan is set out in detail; it cludes investigation of climate, soil, geology and biology of typical subtropical desert, avanna, bush and coast, and tropical steppe, rain forest, mountain, coast and islands. Work existing scientific organizations would be coordinated with the plan, especially the UNESCO vestigation of arid regions. *Subject Headings:* **1. Bioclimatology 2. Tropical triennium.**— *E.P.B*

ENVIRONMENTAL INFLUENCES

See also: **Snow cover and climate . . .** (Miller), 6.10–8; **Microclimatic survey** (Uhlig), 6.10–170; **Fog capture by forest** (Hori), 6.10–178; **Air flow through valleys** (Kaps), 6.10–184; **Fog droplet size distribution** (Okita), 6.10–212.

6.10–268 551.588(58):631.67

Gal'tsov, A. P., **O klimaticheskom vzaimodeĭstvii oroshaemykh i neoroshaemykh ploshcha- eĭ.** [Climatic interaction of the irrigated and nonirrigated areas.] *Akademiia Nauk SSR, Izvestiia, Ser. Geogr.*, No 3:11–20, **1953. DLC**—Methods and results of microclimate bservations carried out in Sept. 1951 by a group of Geographical Institute workers in irrigated otton fields and adjoining desert lands near the lower reaches of the Amu Darya River in Kazakhstan. The measurement of air temperature and air humidity with ventilated psy- hrometers at 20 and 150 cm heights and wind speed measurement with hand anemometers t 1 and 2 m heights at 5 points (3 on irrigated fields and 2 on desert land), oriented as to ind direction, showed the gradual transformation of air currents coming from the desert, nd its influence on the microclimate. The results of observation, presented in graphs and ables, show that 1) the presence of surface temperature inversions does not protect the oasis rom the influence of the desert and 2) that the transformation of air masses proceeds along he same lines during the day and at night. The marginal irrigated lands, to a distance of everal km from the desert boundary line, experience the drying effect of deserts and require ore irrigation than the central portion of the oasis. *Subject Headings:* **1. Irrigation effects Desert influences 3. Kazakhstan, U.S.S.R.**—*A.M.P.*

6.10–269 551.588.6:551.521.

Brecheen, K. G., **Transmission of shortwave radiation through forest canopy.** *U. S. Corps of Engineers and U. S. Weather Bureau, Cooperative Snow Investigations, Research Note* Oct. 15, 1951. 12+p. 3 tables, 5 figs. (1 fold.), 4 refs. **DWB**—The relationship betwee canopy density, estimated from aerial or ground photos (from below), and the radiatio amount which penetrates a forest cover are investigated. Both pyrheliometer and lightmete readings were used. A detailed statistical investigation was made which, however, was no justified by the few widely scattered results. *Subject Headings:* **1. Forest influences 2. Sola radiation in forests.**—*A.A.*

6.10–270 551.588.6:551.524.

Takeda, Kyôichi and Motoki, Shigeru, **On temperature rise of the ground on the leewar of a forest.** *Tokyo. Forest Experiment Station, Bulletin*, No. 64:57–62, Oct. 1953. 2 figs 2 refs., 5 eqs. In Japanese; English summary p. 62. **DWB**—Temperatures of the groun were measured at a number of points in an area surrounding an artificially planted fores The temperatures of the ground surface were found to be 1 or 2°C higher on the leeward c the forest than on the windward on clear days. A theoretical discussion was made with th result that the forest must diminish the Austausch coefficient of air from 5×10^4 to 1×10^4 i order to make the temperature higher on the leeward by the above-mentioned magnitud *Subject Headings:* **1. Temperature microvariations 2. Forest influences.**—*Authors' abstract.*

SYNOPTIC CLIMATOLOGY

See also: **Broad-weather frequency** (Essenwanger), 6.10–168.

6.10–271 551.589.1:930.26(49

Schamp, Heinz, **Der Turm der Winde in Athen und die Luftkörperklimatologie.** [Th tower of the winds in Athens and air mass climatology.] *Die Erde*, 1955(2):119–128. 4 figs 16 refs. **DLC**—The "Horologion" is described. The Greek names for the winds referred t their weather and climatic characteristics and hence were symbols of air mass properties a Athens. The air mass climate of Greece is briefly described. *Subject Headings:* **1. Air mas climatology 2. Tower of the Winds, Athens 3. Greece.**—*C.E.P.B.*

6.10–272 551.589.5:629.13(8

*Surinam. Meteorological Service, **Number of simultaneous occurrences of specifie visibility ranges and specified ranges of the height of the base of the lowest cloud layer coverin more than 4/8ths of the sky, Aerodrome Zanderij (81255), Sept.–Oct. 1954.** 2 pieces. 12 tables. **DWB**—Contingency tables for each of the 24 hours for each month, for Zander Airport in Surinam (S. America). Ceiling and visibility groups are according to WMO 1949 code specifications. *Subject Headings:* **1. Ceiling and visibility data 2. Aeronautica climatology 3. Zanderij Airport, Surinam.**—*M.R.*

MISCELLANEOUS

VISIBILITY

See also: **Determination of extinction** (Oskanjan), 6.10–157; **Visibility, Zanderij Airport, Surinam** (Surinam Met. Service), 6.10–272.

6.10–273 551.591:551.50

Vassy, E., **Une nouvelle méthode pour la mesure de la visibilité horizontale.** [A ne method for measurement of horizontal visibility.] *La Météorologie*, Paris, Ser. 4, No. 33:99 102, Jan./March 1954. 5 figs., 5 refs., 4 eqs. French, English and Italian summaries p. 9

DWB—The value of the formula $V=\frac{1}{\sigma}\log\left(\frac{I}{E_t}-2\log X\right)$, where I is brightness intensity an E_t is threshold of illumination for determining visual range (Vibal) is examined. Owing t

rrors involved in determining σ, coefficient of atmospheric absorption and to the complexity nother method is proposed. This involves a direct measurement of the horizontal visual nge with the aid of a "vibalmetre" and transmitting the value obtained to the pilot. *Subject leading:* **1. Visibility measurement techniques.**—*I.L.D.*

OPTICAL PHENOMENA

6.10–274 551.593.1:52:535.3

Queney, Paul and Arbey, Louis, **Modifications de la réfraction astronomique par les cteurs météorologiques.** [Astronomical refraction as modified by meteorological factors.] *Académie des Sciences, Paris, Comptes Rendus,* 240(5):551–553, Jan. 31, **1955.** 5 eqs. **DWB**—stronomical refraction is usually determined by assuming that surfaces of equal refractive ndex are horizontal. The authors introduce a formula for calculating "additional refraction" hich results from motion or disturbances of the atmosphere. This correction accounting or meteorological factors is of the same order of magnitude as the one accounting for zenithal istance. It is believed that this theory will explain certain anomalies observed at the Paris bservatory. It appears necessary, to take into consideration "additional refraction" in all igh-precision astronomical measurements aimed at obtaining physically conclusive data. *ubject Headings:* **1. Astronomical refraction 2. Atmospheric refraction 3. Meteorological ffects on refraction.**—*G.T.*

6.10–275 551.593.651

Malsch, W., **Beobachtung irisierender Wolken.** [Observation of iridescent clouds.] *Meteorologische Rundschau,* 8(3/4):67–68, March/April **1955. MH-BH**—In 47°2′N, 10°33′E t 1800 m on March 16, 1955 lenticular As clouds in deep blue sky showed brilliant iridescence. ridescence was seen the day before at Karlsruhe. *Subject Heading:* **1. Nacreous clouds.**—*E.P.B.*

6.10–276 551.593.7

Alvarez-Castrillón y Bustelo, M., **Polarización de la luz del cielo en Barcelona.** [Sky ght polarization in Barcelona.] *Revista de Geofisica,* 11(41):61–104, Jan./March **1952.** 8 figs., tables. Spanish and English summaries p. 61–62. **DWB**—Report on systematic bservations on the distribution of polarization over the sky, especially at the pole, the zenith nd at an angle of 90° from the sun. The degree of polarization is somewhat smaller than sual, decreasing especially on hazy days. The dependence on the intensity of solar radiaion, measured without filters and with a red, black and blue filter is shown. Isopleths are iven for the degree of polarization dependent both on solar height and the height of a point n the meridian, as well as on the solar azimuth. Frequency distributions of the polarization re given. Smoke coming from forest fires in Canada resulted in a sharp decrease of polarizaion. *Subject Headings:* **1. Sky light polarization 2. Forest fires 3. Barcelona, Spain . Canada.**—*A.A.*

6.10–277 551.593.7:523.3

Dollfus, Audouin, **La courbe de polarisation de la Terre et la nature du sol lunaire.** [Polarization curve of the earth and properties of the lunar soil.] *Académie des Sciences, Paris, Comptes Rendus,* 235(18):1013–1016, Nov. 3, **1952.** 2 refs. **DWB**—The polarization urve of light reflected by the moon makes it possible to determine that of the earth, leaving nly a factor which was calculated by combining the polarization of the atmosphere, of the oil and of clouds. Laws of this integration were investigated by means of aerostat measurements. The depolarization coefficient of the lunar surface is a function of albedo and corresponds to that of volcanic ash. *Subject Headings:* **1. Polarization 2. Polarization measuring equipment 3. Albedo of moon 4. Lunar atmosphere.**—*Trans. of author's abstract.*

6.10–278 551.593.7

*†Jensen, Chr., **Die Polarisation des Himmelslichts.** [Polarization of sky light.] *Handuch der Geophysik,* Berlin, 8:527–620, **1942.** figs., tables, 73 refs. **DLC**—An unusually

thorough treatment of the subject of atmospheric polarization, with a review of all of th important literature and contributions to this subject, instrumental and observations tech niques, theory, etc. from ARAGO (1809) to 1912, and from 1912 to date. The author's wor comprises numerous publications from 1899 to 1942. The neutral points, plane of polarizatio zenith polarization, seasonal variations, spectral variations in neutral points, effect of turbidit day, twilight and night polarization, eclipse polarization and data on all of these, current an future, are discussed. Finally, relation of polarization to weather is considered. *Subje Headings:* **1. Skylight polarization 2. Neutral points.**—*M.R.*

6.10–279 551.593.7:523.7

Wörner, Heinrich, **Messungen der Himmelspolarisation bei Sonnenfinsternissen.** [Mea urements of sky polarization during solar eclipses.] *Zeitschrift für Meteorologie*, 9(5):143–15 May **1955.** 3 figs., table, 9 refs., 12 eqs. **MH-BH**—At totality some repeatedly scattere light is received from illuminated regions. A formula is developed which expresses th scattered light in terms of sky polarization and sky light. Observations during eclipses fro 1912–54 are examined and recommendations for future measurements are made. *Subje Headings:* **1. Sky light polarization 2. Solar eclipses.**—*C.E.P.B.*

ELECTRICAL PHENOMENA

See also: **Conductivity by meters** (Coroniti et al.), 6.10–86; **Vertical ion transport** (Peiffer, Mitra), 6.10–119; **Lightning research** (Morrison), 6.10–293.

6.10–280 551.594.22

Bossolasco, Mario, **La durata dei lampi.** [The duration of lightning flashes.] *Geofisi e Meteorologia*, Genoa, 2(5/6):87–88, Sept./Dec. **1954.** fig. **DWB**—An analysis of the dura tion of 1274 lightning flashes measured during 1952, 1953 and 1954 is presented in the for of a frequency curve. The relationship of duration to type of discharge, the method of r cording and the inherent errors involved are discussed. *Subject Heading:* **1. Lightning flas duration.**—*I.L.D.*

AURORAS

See also: **Auroral spectrum** (Meinel), **6.10–165.**

6.10–281 551.594.5:535.2

Ashburn, Edward V. (*Geophysical Inst., Univ. of Alaska, College, Alaska*). **Photometr of the aurora.** *Journal of Geophysical Research*, Wash., D. C., 60(2):205–212, June 195 8 figs., table, 7 refs. **DWB**—Simultaneous measurements of the 5577A line and the 3914 line in the aurora are described. The measurements were made with a scanning photoelectr photometer. The 3914A line was present toward the north during the entire period of ob servation. The 3914A line usually showed a larger increase relative to the night-sky back ground than did the 5577A line. In a pulsating aurora, the 3914A line showed many sma pulsations, whose period was 1 to 2 sec, in addition to the large pulsations. *Subject Headin* **1. Auroral photometry.**—*Author's abstract.*

6.10–282 551.594.51 550.38

Alfvén, H. (*Roy. Inst. of Techn., Stockholm*), **On the electric field theory of magnet storms and aurorae.** *Tellus*, Stockholm, 7(1):50–64, Feb. **1955.** 10 figs., 12 refs., numerou eqs. **DLC**—The electric field theory is discussed and further developed. The basic assump tion of the theory is that the sun emits beams of rarified ionized gas which are electrically polarized. The electric field of the beam produces a discharge of Malmfors-Block's typ around the earth. At the same time the electric field produces a variation in the cosmic ra intensity. The theoretical treatment starts by an analysis of the motion of charged particle in the equatorial plane of the earth under the action of the electric field. This phenomenon supposed to be of basic importance. The motion produces space charge in certain region

This charge is supposed to leave the equatorial plane along the magnetic lines of force. These two basic assumptions, which are supported by the model experiments, lead to a theory which gives a fairly good picture of magnetic storms and aurorae. In the earlier presentation of the theory the inertia of the beam was neglected. The theory gave a description of the mean phase of a storm. The motion in the equatorial plane produces a clockwise ring current at about 7 earth-radii from which a discharge to the auroral zones takes place. In the present paper also the inertia of the beam is taken into account. The result is that a second ring current is produced, which flows anti-clockwise at about 30 earth-radii. This current which seems to account for the initial phase of a storm, should be associated with an "inner auroral zone" with a polar distance of 5°–10°. The importance of observing aurora and magnetic disturbances in this region is stressed. *Subject Headings:* **1. Auroral theories 2. Magnetic storm theories 3. Alfvén's theory 4. Electric field theory of auroras.**—*Author's abstract.*

6.10–283 551.594.51

Block, L. (*Roy. Inst. of Techn., Stockholm*), **Model experiments on aurorae and magnetic storms.** *Tellus*, Stockholm, 7(1):65–86, Feb. **1955.** 20 figs. (incl. photos), 10 refs., eqs. **DLC**—Model experiments on ALFVÉN's electric field theory of auroras and magnetic storms have been performed. The transformation laws from nature to model are considered. It is concluded that a proper scaling down of every detail in nature is not possible. Only the most significant features are scaled down properly. It is shown that a mechanism like ALFVÉN's proposed auroral mechanism is very likely to be present in the model. In particular the conception seems to be experimentally confirmed that space charge accumulated in the discharge region, rather than destroy the whole pattern of motion, discharges along the magnetic field lines. *Subject Headings:* **1. Auroral theories 2. Alfvén's theory 3. Electric field theory of auroras 4. Experimental auroras.**—*Author's abstract.*

6.10–284 551.594.51

Fan, C. Y. and Shulte, D. H. (*Yerkes Observ.*), **Variation in the auroral spectrum.** *Astrophysical Journal*, 120(3):563–565, Nov. **1954.** 3 figs., 4 refs. **DLC**—A patrol study of auroral emissions was made with a fast grating spectrograph at the Yerkes Observatory. It was found that (1) all quiet arcs showed a very intense $H\alpha$ line, whereas rayed features never showed $H\alpha$; (2) the Meinel system of N_2^+ underwent little variation relative to the First Positive system of N_2. The implications of these findings are discussed. *Subject Headings:* **1. Auroral spectrum variations 2. Auroral spectra.**—*Authors' abstract.*

6.10–285 551.594.51

Gerson, Nathaniel C. (*ed.*), **Introduction [to the Proceedings of the Conference on Auroral Physics].** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 30:1–39, July **1954.** 35 figs. **MH-BH**—This introduction is a compilation of reference material intended to make the Proceedings of the Conference on Auroral Physics self-contained. Relatively brief descriptions of some aspects of the high atmosphere are given but extensive discussions are avoided. Information on pertinent atomic and molecular properties is included. It is hoped that this data will be helpful in coordinating and integrating the various papers presented at the Conference. *Subject Heading:* **1. Auroral physics conferences.**—*Author's abstract.*

6.10–286 551.594.51:535.33

Herman, L. and Herman, R. (*Univ. of Paris*), **Laboratory studies of auroral afterglow.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 30:221–241, July **1954.** 10 figs., 2 tables, 36 refs., 13 eqs. **MH-BH**—Clarification of several features of the polar aurora is attempted. A new band system is identified in the spectrum of nitrogen. The effect of collisions upon the apparent lifetime of the 5577 A (O I) line is described. An examination is made of the role of water vapor in the formation of OH, and the emissions of OH from the night airglow are briefly described. Spectra of the aurora obtained in College, Alaska, were compared with spectra obtained in the laboratory. The laboratory spectra of emission from a discharge tube containing pure nitrogen revealed new bands in the near

infrared. Although some of these new bands are also present in the spectrum of the auror the rotational temperature and the perturbations found in the laboratory are different fro those in the aurora; this comes from an overlapping of two different band systems. Th possible origin of the new infrared bands is described. A tentative classification is made in single vibrational scheme. Results indicate that the emission of 5577 A (O I) from atomi oxygen arises, not from electron impact, but from indirect collison processes. *Subject Heading* **1. Auroral afterglows 2. Auroral nitrogen bands 3. Experimental auroral spectra 4. Auror spectra.**—*From authors' abstract.*

6.10–287 551.594.51:551.524.

Jones, A. Vallance and Harrison, A. W., **Rotational temperatures of the auroral N_2^+ bands** *Journal of Atmospheric and Terrestrial Physics*, 6(6):336–343, June **1955.** 5 figs., table, 1 refs. **DWB**—The basis of temperature computation from auroral spectra is discussed. Fiv plates of 3914Å band were obtained with a high-dispersion spectrograph at Saskatoon an temperatures estimated. They ranged from 250–400°K but a considerable contributio from a region as low as 200°K is necessary to give the observed intensities. Some of the plot showed curvature attributed to variation of temperature with height in auroral region. *Subje Heading:* **1. Auroral temperatures.**—*C.E.P.B.*

6.10–288 551.594.51:550.38:551.510.53

Meek, J. H. (*Physics Dept., Saskatchewan Univ., Saskatoon, Canada*), **Correlation o magnetic, auroral, and ionospheric variations at Saskatoon, Pt. 2.** *Journal of Geophysica Research*, Wash., D. C., 59(1):87–92, March **1954.** fig., 8 refs. **MH-BH**—The relation between magnetic, auroral, and ionospheric observations are summarized with reference t the occurrence of positive and negative magnetic bays. Auroral light associated with positive bays occurs at a higher geomagnetic latitude than that associated with negative bays. The magnetic and auroral light variations are compared to MARTYN's theory of the aurora. I the latter is accepted, the conclusion is reached (1) that most auroras are caused by positively charged particles, and (2) that the conditions described for the early phase actually exist throughout most of a disturbance. (For Pt. 1, *see* 5C–260, March 1954, *MAB*.) *Subject Headings:* **1. Auroral intensity variations 2. Auroral-ionospheric relationships 3. Auroral-magnetic relationships 4. Martyn's auroral theory.**—*Author's abstract.*

6.10–289 551.594.51

Meek, J. H., **The location and shape of the auroral zone.** *Journal of Atmospheric and Terrestrial Physics*, 6(6):313–321, June **1955.** 7 figs., 13 refs. **DWB**—Variations of the earth's magnetic field have been examined, using data of the Polar Year 1932–33. It is concluded that the auroral zone takes the form of two opposing Störmer-like spirals, one due to positive-particle precipitation and the other due to negative-particle precipitation. These spirals intersect each other at a high latitude at about 10 a.m. local geomagnetic time, and at a lower latitude at about 10 p.m., and move around the earth with the sun. It is proposed that the disturbance-particle stream coming from the sun is not necessarily continuous or uniform. As it passes the earth, charged particles are ejected from it and follow Störmer trajectories into the auroral zone, resulting in the observed auroral light displays and magnetic disturbances. Some of the observed characteristics of aurora are discussed in view of this proposal. *Subject Heading:* **1. Auroral theories.**—*Author's abstract.*

6.10–290 551.594.51

Meredith, L. H.; Gottlieb, M. B. and Van Allen, J. A. (*Univ. of Iowa, Dept. of Physics*), **Direct detection of soft radiation above 50 kilometers in the auroral zone.** *Physical Review*, New York, 2nd Ser., 97(1):201–205, Jan. 1, **1955.** 4 figs., 3 tables, 7 refs. **DLC**—In two high-altitude rocket flights of thin-walled Geiger tubes at geomagnetic latitudes 64° and 74°N, a considerable intensity of soft radiation has been encountered above 50 kms altitude. No such radiation has been found in flight of identical equipment at 88.5° and at 55.6°. The radiation is tentatively interpreted as the high-energy tail of the auroral spectrum. It may consist of electrons. *Subject Heading:* **1. Auroral radiations.**—*Authors' abstract.*

6.10–291 551.594.51:551.524.7

Shepherd, G. G. and Hunten, D. M., **On the measurement of rotational temperature from unresolved auroral nitrogen bands.** *Journal of Atmospheric and Terrestrial Physics.* 6(6): 328–335, June **1955.** 5 figs., 2 tables, 10 refs. **DWB**—Measurements of 180 auroral spectra on the 3914 Å band are described, including correction to give line intensities, neglect of which makes the temperature estimates too low. Temperatures varied from 150–465°K, mean 258°K. Classification by auroral type indicates an increase with height. Heights were obtained by double photograph on 15 occasions; height distribution of temperatures is irregular but not inconsistent with rocket temperatures. *Subject Heading:* **1. Auroral temperatures.**—*C.E.P.B.*

6.10–292 551.594.51:551.524.7

Shepherd, G. G. and Hunten, D. M., **Variation of rotational temperature with height in the aurora.** Saskatchewan. Univ. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-11, [**1954?**] 22 p. 4 figs., 4 tables, 15 refs. **DWB**—A considerable number of auroral spectra of the negative group band N_2^+ (00) at 3914 A have been obtained with a scanning spectrometer. For some of these spectra, auroral heights were determined by means of double station photography. Rotational temperatures were measured from the band profiles by the usual method which is described. The results indicate an increasing rotational temperature with height through the lower auroral region. This is in qualitative agreement with the accepted kinetic temperature variation in that region. *Subject Headings:* **1. Auroral spectra 2. Auroral spectrometers 3. Rotational temperatures of auroras.**—*Authors' abstract.*

ATMOSPHERIC AND RADIO PROPAGATION

See also: **Long wave reflection** (Sato), **6.10–120.**

6.10–293 551.594.6:551.594.221

Morrison, R. B., **Atmospherics and meteorological research.** *Weather,* 10(5):147–151, May **1955.** 3 figs., 10 refs. **DWB**—A brief summary is given of radar and lightning investigations of thunder clouds. The wave-form of atmospherics and their use in locating thunderstorms are described. *Subject Headings:* **1. Atmospherics 2. Lightning.**—*C.E.P.B.*

6.10–294 551.594.7:621.396.029:551.590.25

Chechik, P. O., **Dal'niaia radiosviaz' vsledstvie otrazheniĭ ot meteornykh sledov.** [Distant radio communication due to reflection from meteoric tracks.] *Priroda,* Moscow, 43(12): 92–93, Dec. **1954. DLC**—Considerations are presented indicating that as a result of the vaporization of meteors in the earth's atmosphere, ions are formed which recombine and diffuse. The amplitude of the radio signal reflected from meteoric tracks is proportional to the electron density and owing to recombination and diffusion it diminishes gradually. Examples are cited of the possibility of radio communication at night with waves of 21 m at distances of 1200 km and at a time when there was no reflection from the regular ionospheric layer. *Subject Headings:* **1. Short wave radio transmission 2. Radio wave reflection from meteoric tracks.** —*I.L.D.*

6.10–295 551.594.7:621.396.092.6

Hartsfield, W. L. and Silberstein, R., **A comparison of CW field intensity and backscatter delay.** *Institute of Radio Engineers, Proceedings,* 40(12):1700–1706, Dec. **1952.** 6 figs., 14 refs. **DWB**—The relationship of back-scatter to skip phenomena was studied for several months by comparing the field intensity of 15 000 kc/s (15 Mc/s) W.W.W. Signals received at White Sands Proving Ground, New Mexico with recorded delay times of the back-scatter received over the 2700 km distance at Sterling, Va. The results are given in A-scope photos, graphs and curves. Back-scatter data may provide an indicator even better than the direction finder technique in forecasting disturbances. *Subject Headings:* **1. Microwave propagation 2. Field intensity 3. White Sands, New Mexico.**—*W.N.* T-12226

ACOUSTICAL PHENOMENA

6.10–296 551.596.1 532.5

Gutenberg, B., **Effect of low-velocity layers.** *Geofisica Pura e Applicata*, Milan, 29:1–10 Sept./Dec. 1954. fig., 42 refs., 2 eqs. English summary p. 1. **MH-BH**—Effects of low-velocity channels in the atmosphere, the ocean and the solid earth are discussed. There are two major low-velocity channels in the atmosphere, one with its axis at the tropopause, and another at a height of about 80 km. They produce "zones of silence" and permit the transmissions of waves involving the whole atmosphere. Low-velocity layers in the ocean result from the combined effects of temperature, pressure and salinity. In the earth, the sudden decrease of velocity at the boundary of the core produces a low-velocity channel for elastic waves. In the earth's crust there are two major low velocity channels, one below the Mohorovičić discontinuity, the other at a depth of about 15 km. Misinterpretation of their effects has caused incorrect conclusions concerning the structure of the outer portion of the earth's mantle. *Subject Headings:* **1. Acoustical propagation 2. Wave propagation.**—*Author's abstract.*

6.10–297 551.596.9:536.421

Dibner, V. D., **Shum zamerzaiushcheĭ vody.** [Noise of freezing water.] *Priroda* Moscow, 9:116–117, Sept. 1952. **DLC**—The author observed in the Arctic that the growth of numerous ice crystals during the freezing of a shallow layer of water is associated with an unusual monotonal and uninterrupted noise. *Subject Headings:* **1. Freezing water noise 2. Acoustical phenomena**—*I.L.D.*

PART II. ANNOTATED BIBLIOGRAPHY ON WEATHER MODIFICATION

By: *Geza Thuronyi*

INTRODUCTORY NOTE

This is the fifth and last in a series of bibliographies on the physics of clouds and precipitation which supplement the highly selective bibliography on *Cloud Physics and Artificial Precipitation* published in our March 1950 issue (Vol. I, No. 3). Most of the material presented below is for the period 1950–1955, as we did not wish to duplicate material already published in the earlier contribution.

The present bibliography contains over 550 items. Space did not permit publication of abstracts on all of them. It was considered better to run and index them all in one issue, even though over 200 items combined in: 6J-346 and 6J–347, are entered without annotation than to omit them or publish two bibliographies on this subject. The references in 6J–346 are to 77 papers prepared by Dr. I. P. Krick and collaborators. Additional references, which have not been repeated herein, will be found listed in Part III, Vol. 4, No. 8, p. 963–968, Aug. 1953, *MAB*. These items have not been seen or checked, but can be found in the archives of the American Institute of Aerological Research, 460 South Broadway, Denver, Colorado. The 128 miscellaneous contributions listed under 6J 347 *have* been seen and checked, but were either articles which have appeared in earlier issues of MAB, or articles whose titles were self-explanatory or were considered to be of purely local or regional interest.

The criteria used in defining the scope of this bibliography are roughly as follows. All articles primarily concerned with the observational, climatological or theoretical aspects of cloud physics were included in one or other of the previous bibliographies in this series; those primarily concerned with the practical aspects of cloud seeding, or the operational aspects of "rain making" or weather modification, were reserved for the present bibliography. A few historical items on semi-scientific or scientific attempts at rain stimulation or hail suppression are included for the sake of perspective. Likewise a few articles on techniques (mainly statistical) for evaluating the relative success of different methods of attempting to increase or decrease precipitation are included.

The main body of material, however, stems from the Schaefer-Langmuir experiments of 1946–47, and the "chain-reaction" they produced throughout the semi-arid agricultural regions of the world, where an increase of even a few percent in rainfall at the critical season would bring untold benefits to most interests. Among the by-products have been: (1) a more "scientific" approach to evaluation of the centuries old practice of hail-shooting in the vineyard areas of Italy, France and Switzerland; (2) attempts at thunderstorm suppression in the Pacific Northwest forest areas during the critical fire season; (3) seemingly successful attempts to dissipate supercooled stratus cloud decks (or at least striped patterns in these cloud layers) etc., and lastly the legal aspects which have opened up a whole new area for local, interstate and international control and legislation.

The world-wide interest in this subject, as well as the broad scope of the operations, can be seen in the following subject and geographic outline of contents. It does not attempt to be exhaustive, but merely to bring out the most important topics in a wide range of material. For additional material *see also* under Applications (cloud seeding) in the subject outline of the bibliography on **Cloud Physics** (June 1955, p. 809) and the bibliography on **Radar Cloud Physics** (July 1955, p. 1000).

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1839

6J–1 551.509.67

Espy, James P., [Artificial rains], *The National Gazette and Literary Register*, Philadelphia, 19(5798), Title page, April 5, **1839.** Reprinted in his **Philosophy of Storms.** Boston, **1841.** p. 492–500. **DLC**—It is suggested "that an experiment should be made to see whether rain may be produced artificially in time of drought." The experiment was to be based on the principle that clouds are formed by upward currents of air. Such currents could be produced by burning large fires. Evidence is produced to the effect that rain was frequently observed in connection with major conflagrations and volcanic eruptions. *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

1843

6J–2 551.509.67

Espy, James Pollard, **Report on Meteorology. First to Fourth.** Wash., D. C. (**1843**)–**1857.** 4 vol. in 3. numerous charts, tables. **DLC**—In the first Report (p. 2) the author suggests (in accordance with his theory of rain formation as an effect of upward currents) that salt marshes, prairies or timber destined to be burned should be preserved to be set on fire in drought periods; ensuing rainfall should be observed and reported. Throughout Reports 2–4 numerous instances of rainfall resulting from large fires are reported and certified. (For fuller abstract, *see item* 6.2–8, Feb. 1955, *MAB.*) *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

1853

6J–3 551.509.67

On the causes of rain and the possibility of modifying them by art. *Scientific American*, 8(21):168, Feb. 5, **1853. DLC**—In this two-column communication DANIEL VAUGHAN suggests a technique for triggering the release of rainfall. Considering that electricity is liberated whenever vapor is condensed, further condensation will be retarded if the escape of electricity cannot take place. By discharging electricity in the upper part of the atmosphere rainfall may be released. A momentary communication with the imprisoned electricity may be achieved by a body of water projected into the atmosphere by pressurized air or carbonic acid. Describes the mechanism with which this could be achieved. *Subject Headings:* **1. Artificial precipitation. I. Vaughan, Daniel.**—*G.T.*

1880

6J–4 551.509.67

Ruggles, Daniel (*Fredericksburg, Va.*), **Method of precipitating rain-falls.** *U. S. Patent Office, Patent* No. 230,067, July 13, **1880.** [2 p.+plate] diagr. **DP**—Also: **New method of precipitating rainfalls.** *Scientific American*, 43(7):106, Aug. 14 and 43(22):342, Nov. 27, **1880.** fig. **DLC**—

The method described in the patent specification involves sending up balloons carrying explosives and detonating the latter by electrical means. Rain clouds would be condensed by the force of concussion. Thus rain could be produced or be prevented from falling over a specified region by precipitating the clouds before they reach the region. *Subject Headings:* **1. Artificial precipitation patents 2. Patents.**—*G.T.*

1891

6J–5 551.509.67

Gathman, Louis (*Chicago, Ill.*), **Method of producing rain-fall.** *U. S. Patent Office, Patent* No. 462,795, Nov. 10, **1891.** [1 p.] **DP**—The method constituting this invention involves diffusion of liquefied carbonic acid in the upper atmosphere. The sudden expansion will chill the atmosphere and cause condensation. The carbonic acid, contained in a shell or casing is thrown, shot, or carried in a balloon into the upper atmosphere, where it is liberated by explosion. *Subject Headings:* **1. Artificial precipitation patents 2. Patents.**—*G.T.*

1900

6J–6 551.509.67

Abbe, Cleveland, **Artificial rain.** *Monthly Weather Review,* 28(1):22–23, Jan. **1900. DLC**—A note reflecting the U. S. Weather Bureau's negative attitude toward FRANK MELBOURNE and other "rain makers." MELBOURNE's technique involved the burning of certain fume-producing chemicals. *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

1907

6J–7 551.509.67

Rain-making experiments in the Klondike. *Meteorological Magazine,* 42(494):29, March **1907.** Also (same title): *Royal Meteorological Society, Quarterly Journal,* 33(143):199–200, July **1907. DLC**—Reprints from the *Times,* London, of Feb. 11, 1907, briefly reporting an unsuccessful rain-making attempt in the Yukon Territory. The attempt was made by C. M. HATFIELD of Los Angeles. *Subject Headings:* **1. Artificial precipitation 2. Klondike, Yukon Territory, Canada.**—*G.T.*

1908

6J–8 551.509.67:551.577.38

Bates, D. C., **Report upon dry period and rainmaking experiments at Oamaru, New Zealand.** *Meteorological Magazine,* London, 43(510–512):107–111, 137–138, 156–159, July–Sept. **1908.** tables. Also (with comment by Cleveland Abbe) as: **Rain-making in New Zealand.** *Monthly Weather Review,* 36(7):208–213, July **1908.** fig., tables. **DLC**—Data on extensive drought in Oamaru district, N. Z. (1906–07), and detailed description of operation and results of a rainmaking project which the author observed as a meteorological expert. Explosives were fired from dynamite detonators during conditions favorable for rain formation. The operation was inconclusive; energies supplied by the detonations are negligible compared to amount of heat exchange in precipitation formation and other atmospheric processes. Climate could be more effectively improved by afforestation. *Subject Headings:* **1. Drought 2. Weather control 3. New Zealand. I. Abbe, Cleveland.**—*G.T.*

1930

6J–9 551.509.67

Berg, A., **Bemerkungen über das Verfahren des Herrn A. Veraart (Rijswijk) zur Erzeugung künstlicher Regen.** [Comments on the technique of A. Veraart (Rijswijk) for producing artificial precipitation.] *Zeitschrift für angewandte Meteorologie,* 47(6):161–171, June **1930. DWB**—Critical examination of VERAART's claims that condensation of 20,000 kg water vapor may be obtained through the cooling power of 2,000 kg ice of −100°C. According to the author's calculations 50,000 and not 2,000 kg ice would be required for such an effect and this quantity would have to be dispensed at an impracticable rate. Rain water thus obtained would be economically insignificant, if it ever reached the ground. *Subject Heading:* **1. Cloud seeding with ice.**—*G.T.*

6J–10 551.509.67

Dubuc, E., **Les pluies artificelles par le procédé Dessoliers.** [Artificial rainfall by the Dessoliers process.] *La Géographie,* Paris, 53(1/2):39–43, Jan./Feb. **1930. NNA**—Rain producing scheme of DESSOLIERS is explained, based on theory of the tropical atolls of the Pacific where water evaporates from the central lagoon and causes cloud and rain over the island. He would apply scheme to the Barbary Coast, North Africa, to insure rainfall by reconstructing physical conditions similar to the atolls in the small lakes left by the winter rains in hilly regions of the Barbary Coast, around which agricultural areas would develop. Problem of the dryness of the North African air

considered. (*Same item as* 3A–114, Jan. 1952, *MAB.*) *Subject Headings:* **1. Artificial precipitation North Africa.**—*H. P. Kramer.*

1932

6J–11 551.509.67:551.578.7

Kleinschmidt, E. (*Stuttgart*), **Das Hagelschiessen.** [Hail shooting.] *Zeitschrift für angewandte eteorologie*, 49(11):321–330, Nov. **1932.** ref. **DWB**—Upon examining various arguments ad- nced in favor of the possible effectiveness of hail shooting, the author finds that hail rockets of the pe used at the time cannot effectively prevent hailfall either by sound waves or by heat, the supply condensation nuclei (overseeding), or the generation of electrical charge. Statistical data pre- nted give no indication of any result from hail shooting. Even if results were favorable, the cost operation would exceed the damage caused by hail. *Subject Heading:* **1. Hail shooting.**—*G.T.*

1939

6J–12 551.509.65

Pleasants, Clellan Ross, **Method for vapor clearing.** *U. S. Patent Office, Patent* No. 2,160,900, ne 6, **1939.** [2 p.] Also his: **Method and composition for dispelling vapors.** *Ibid.*, No. 2,232,728, eb. 25, **1941.** [3 p.] **DP**—In these documents the inventor describes his method of dispelling g by dispersal of finely divided particles of amorphous carbon coated with a hygroscopic agent. *bject Headings:* **1. Fog dissipation patents 2. Patents.**—*G.T.*

1948

6J–13 551.509.67

Pettit, K. G. and Orr, J. L., **Suggested procedure for inducing precipitation from cloud.** *Na- nal Research Council of Canada. Low Temperature Laboratory, Laboratory Note*, LT-6-48, July 6, **48.** 6 p. 2 figs. **DWB**—Details to be followed in dry ice seeding are suggested for the benefit groups interested in conducting rainmaking experiments. The points discussed are: prerequisite eteorological conditions (cloud identification, limitations), preparation of dry ice, flight technique eeding pattern, rate of distribution, dispensers) and aircraft requirements. Illustrations show pical cumulus cloud formations and a simple dry ice dispenser. (Run by title only as C–154, arch 1950, *MAB.*) *Subject Headings:* **1. Cloud seeding with dry ice 2. Cloud seeding techniques.** *G.T.*

6J–14 551.509.67

Philippines. Weather Bureau, **Report on experiment; artificial propagation of rain, February 1948,** by John P. Webber. 3 p. Photos. typescript. (also available in Weather Bureau Library oto collection, No. 804–814), newspaper clippings. **DWB**—Description, by one of the observers, a cloud seeding experiment carried out with the cooperation of several organizations near Manila. cumulus cloud was seeded with dry ice from an airplane and yielded precipitation shortly after the eding had been completed. Development of the cloud during and after the seeding may be well served on the photographs attached. Clippings from the local press commenting on the event e added. *Subject Headings:* **1. Cloud seeding with dry ice 2. Cloud seeding in Philippines Manila, Philippine Islands. I. Webber, John P.**—*G.T.*

6J–15 551.574.1:532.77

Schulz, Gerhard, **Der Einfluss von Fremdkörpern auf die Unterkühlungsfähigkeit des Wassers.** The effect of foreign substances on the freezing temperature of water.] *Meteorologische Rundschau*, 7/8):237–241, Jan./Feb. **1948.** **DWB**—FINDEISEN succeeded in producing virga artificially from percooled water clouds (1–9°C) by seeding with the finest powdered sea sand. (For fuller abstract, *item* 7–86, July 1950, *MAB.*) *Subject Headings:* **1. Supercooled water 2. Freezing nuclei Cloud seeding with sand.**—*M.R.*

1949

6J–16 551.509.67:34

†Ball, Vaughn C., **Shaping the law of weather control.** *The Yale Law Journal*, 58(2):213–244, n. **1949.** refs. **DLC**—After a competent review of progress in weather modification and of its ssible applications, the author examines the possibility of weather modification activities giving se to criminal or civil action on the basis of (a) claims for personal injury and property damage d (b) claims of property rights in the weather. The author suggests that until the problems nnected with weather modification are cleared up, only the federal government, its contractors, d state and local governments acting in cooperation with it should be allowed to conduct weather ntrol experiments. Legislative action started with a view to regulating such government activity discussed. Ample reference to both scientific and legal literature and documents is given. *Subject eadings:* **1. Weather control legislation 2. Legal aspect of weather control.**—*G.T.*

6J–17 551.509.67:551.57

Bergeron, Tor. **Nyare rön om nederbördens uppkomst och fördelning.** [Recent development in the study of the formation and distribution of precipitation.] *Ymer*, Stockholm, 3:161–188 Sept. **1949.** 24 figs., 13 refs. English summary p. 185–187. **DLC, DWB**—The orographic effect on moisture-laden winds are discussed, leading to the theory that rainfall might be decreased on the windward slopes and be caused to fall by natural processes in the leeward region (as in Sweden) by *overseeding* of clouds with silver iodide on the coasts of Norway. (For fuller abstract, *see item* 10–44, Oct. 1950, *MAB.*) *Subject Headings:* **1. Cloud seeding 2. Overseeding.**—*M.R.*

6J–18 551.509.6

Calvet, Emile, **La pluie artificielle.** [Artificial rain.] *France. Centre de Recherches et d'Expérimentation du Génie Rural, Études et Travaux*, No. 9, **1949.** 56 p. **DA**—In addition to a detailed discussion of natural and artificial rain formation mechanisms and of results in artificial precipitation obtained in various countries, this paper contains a description of cloud seeding experiments undertaken in France. In 1947–1948 Eyraud made successful experiments with dry ice. In North Africa some results were achieved with water, dry ice and silver iodide in 1948 and 1949. Possible benefits to be derived from artificial rainfall are elaborated on. *Subject Headings:* **1. Cloud seeding in France 2. Cloud seeding in North Africa 3. France 4. North Africa.**—*G.T.*

6J–19 551.509.67

Hoff, Amos H., **Lluvia provocada artificialmente.** [Artificially induced rainfall.] *Sociedad Mexicana de Geografía y Estadística, Mexico City, Boletín*, 67(1):195–204, Jan./Feb. **1949. DLC**—Mechanisms by which ice crystals introduced into a cloud disturb the cloud's colloidal stability are discussed in some detail. Dry ice seedings from the air, conducted by the author over Phoenix Arizona, are described in general terms. Several of the seeding operations are reported to have been successful. *Subject Headings:* **1. Cloud seeding with dry ice 2. Arizona.**—*G.T.*

6J–20 551.509.67

*Orr, John L.; Fraser, D. and Petit, K. G., **Analysis of experiments on inducing precipitation.** *National Research Council of Canada, Report* No. MD-32, Aug. 17, **1949.** fig., tables, refs. Also their: **Canadian experiments on artificially inducing precipitation.** *American Meteorological Society Bulletin*, 31(2):56–59, Feb. **1950.** 8 tables, ref. Also: Orr, J. L., **Canadian experiments on induced precipitation.** (In: United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. 1949, **Proceedings, v. 4, Water Resources,** p. 27–36, **1951.** 7 figs. 9 tables, 13 refs.) **DWB**—Fifty nine trials have been made using dry ice. In most cases the structure of clouds was altered, in many cases precipitation was produced, and under certain conditions clouds were generated. (For fuller abstracts, *see items* C–204, 4.2–75 and 4.4–79, March 1950 Feb. 1953 and April 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in Canada 2. Cloud seeding with dry ice 3. Canada.**—*A.A.*

6J–21 551.509.67:551.578.7

Ruby, F., **Rapport général sur la défense contre la grêle en France, 1947 [and] 1948.** [General report on hail control activities in France, 1947 and 1948.] *Lyon. Centre National de Défense Contre la Grêle, [Rapport Générale*, 1947, 1948], [pub. **1948?** and **1949?**]. 61 and 69 p. maps **DA**—Hail control activities in France in 1947 and 1948 are discussed according to administrative regions. Hail control networks and their operation are described in detail and illustrated on maps. The operations were carried out by means of explosive rockets. Qualitative results are indicated. *Subject Headings:* **1. Hail prevention in France 2. France.**—*G.T.*

6J–22 551.509.67:551.578.7

Staub, H.; Thams, I. C. and Zenone, E., **Die Organisation des Grossversuches zur Bekämpfung des Hagels in der Magadino-Ebene.** [Organization of a large scale attempt to control hailstorms in the Magadino Plain.] *Schweizerische Landwirtschaftliche Zeitschrift*, Zürich, No. 41:1113–1124 Oct. 14, **1949.** 5 figs. **DA, MH-BH**—An elaborate hail warning system was set up in the rich mountain valley above Locarno, and attempts at control of hailstorms by rockets (hail shooting) described and illustrated. Comprehensive reports of weather conditions, shooting and effectiveness (damage as estimated by the Swiss Hail Insurance Society) are made each time. Results inconclusive as yet. (*Same item as* 8–30, Aug. 1950, *MAB.*) *Subject Headings:* **1. Hail shooting 2. Hail prevention in Switzerland 3. Hail warning networks 4. Magadino Plain, Switzerland.**—*M.R.*

6J–23 551.509.67:3

Who owns the clouds? *Stanford Law Review*, 1(1):43–63, Nov. **1948.** refs. Also: **Artificial rainmaking.** *Ibid.*, 1(3):508–537, April **1949.** refs. **DLC**—These papers on weather modification (the second being a continuation of the first) contain a detailed discussion of the various legal prin

ples involved in rights of ownership and use of the water in clouds, federal and state powers to gulate rainmaking, liability for damage caused by rainmaking, etc. A brief summary (with ferences) of the early history of rainmaking will also be found here. *Subject Headings:* **1. Legal spects of weather modification 2. Artificial precipitation.**—*G.T.*

1950

6J–24 551.509.67

†Anderson, Charles E., **Evaluation of results of joint Air Force—Weather Bureau cloud seeding ials conducted during winter and spring 1949.** *U. S. Air Force Cambridge Research Laboratories, eophysical Research Papers*, No. 4, May **1950.** 30 p. 4 figs., 4 tables, 35 refs., 3 eqs. **MH-BH**—iscussion of the theory and application of dry ice seeding to cloud dissipation, cloud formation or ecipitation inducement. The tests (48 trials) conducted for this project did not give encouraging sults as far as initiating heavy precipitation from cumulus congestus clouds is concerned. Virga as produced from supercooled cumulus on several occasions. Partial dissipation of cloud occurred 100% of the trials. (*Same item as* 2.1–57, Jan. 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding th dry ice 2. California 3. Mobile, Alabama.**—*M.R.*

6J–25 551.509.67:551.574.1

Banerji, S. K., **Rain-making. The 12th Acharya Jagadish Chandra Bose Memorial Lecture, th Director's Report presented to the 33rd Anniversary meeting of the Bose Institute, Nov. 30, 50.** Prabasi Press, **1950.** 29 p. 3 figs., tables. Summary in *Journal of Scientific and Industrial esearch*, 10(1):35, Jan. **1951. DWB**—The author deals with the physics of drop growth and rain rmation, evaporation, the condensation theory of rain drop growth, BERGERON's theory involving e formation of ice crystals on supercooling, LANGMUIR's work on the growth of cloud droplets accretion, and FINDEISEN's work on the production of ice-forming nuclei during the sublimation water vapor on to a growing crystal. The use of dry ice cloud seeding to produce rainfall, the periments on artificial seedings carried out in Australia, Hawaii and South Africa, the best position the cloud for seeding to obtain optimum results, the effect of seeding on the track of cyclonic orms and the importance of artificial rain in India are discussed. (*Same item as* 6.6-128, June 55, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding in India 3. Cloud ysics 4. India.**—*I.L.D.*

6J–26 551.578.7:551.509.67

Bider, M., **Versuche zur Hagelbekämpfung.** [Attempts to prevent hailstorms.] *Leben und mwelt*, Basel, 6(12):273–279, Sept. **1950. DWB**—The author discusses the problem of cloud spersion by exploding rockets. The problem figured on the agenda of an international conference Graz in 1902. Experiments were made in 1935 in Beaujolais, France, with success claimed by rticipitants. Similar experiments have been in process in the Magadino Plain, Tessin, Switzerland, nce 1948. 48 operators armed with special rockets, whose altitudinal ranges are 600 and 1200 m, e in continual readiness for hailstorm warnings. They prepare detailed records of rockets fired d of the synoptic situation at the time. The experimental project will be carried on for 5 years. he author finds no possible physical explanation for ultimate effectiveness of the method. He also entions cloud seeding as a possible alternative but reserves his final opinion on the subject. Storm ouds in the Magadino Valley and a rocket about to be fired are shown on photographs. (*Same em as* 3.11–86, Nov. 1952, *MAB.*) *Subject Headings:* **1. Hail prevention in France 2. Hail prevention in Switzerland 3. Hail shooting 4. Magadino Plain, Switzerland.**—*G.T.*

6J–27 551.509.67

Brooks, Charles F., **Will New York rainmaking affect New England rainfall?** *Weatherwise*, 2):30–31, April **1950.** 2 photos. **DWB**—The author is of the opinion that seeding over New ork might increase, just as easily as decrease, the rainfall over New England. (*Same item as* 9–45, Oct. 1950, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. New England.**—*M.R.*

6J–28 551.509.67:551.579

Cloud-seeding pays off out West. *Aviation Week*, N. Y., 52(16):39, April 17, **1950. DLC**—loud seeding flights over the Sierras in California are claimed to have produced enough snow to ld 2 billion gallons of water to reservoirs of the California Electric Power Co. Dry ice was used ecause the low flying required for silver iodide seeding is dangerous in the Bishop Valley area. ost was about $200 per hour of flight. (*Same item as* 2.9–49, Sept. 1951, *MAB.*) *Subject Headings:* **Cloud seeding in California 2. Water supply 3. California.**—*M.R.*

6J–29 551.509.67:551.579

Cloud seeding works in California. *Electrical World*, 133(11):70–72, March 13, **1950.** 5 notos. **DLC**—California Electric Power Co. has conducted experiments for two years in the Bishop

Basin (High Sierras), using dry ice to seed cumulus clouds 21 times, with an estimated increase in available water supply (snow) of 14% in 1948 and 12% in 1949. Series of cloud photographs show rapid results obtained from one seeding operation. Chart shows relief of valley. (*Same item as* 8–29, Aug. 1950, *MAB.*) *Subject Headings:* **1. Cloud seeding with dry ice 2. Water supply 3. Cloud seeding in California 4. California.**—*M.R.*

6J–30 551.509.67

Contreras Arias, Alfonso, **Resumen de los resultados obtenidos por instituciones oficiales en relación con las experiencias de tratamiento de las nubes por medio del hielo seco y del yoduro de plata.** [Summary of results achieved by official organizations in cloud seeding with dry ice and silver iodide.] *Chapingo*, Mexico City, 4(38):532–545, July **1950.** diagrs., photos, refs. **DA**—Results of experiments made by official institutions in the U. S., Canada and Hawaii, and opinions of several official authorities concur in pointing out the negative effect of cloud seeding experiments. The author discusses in detail the theoretical and practical factors responsible for this ineffectiveness. However, he recommends further experimentation by competent organizations, in order to obtain a better knowledge of the physical processes involved in precipitation formation. *Subject Heading:* **1. Cloud seeding.**—*G.T.*

6J–31 551.509.67

*Eyraud, R., **La pratique de la pluie artificielle.** [Techniques in artificial production of precipitation.] *France. Météorologie Nationale, Mémorial*, No. 34, **1950.** 44 p. 11 figs., tables, 9 refs. **DWB**—Pt. I of this memoir deals with cloud physics, formation of orographic, frontal and pure convective precipitation, coalescence of drops, and growth by several means, especially in the presence of ice crystals. Pt. II concerns the artificial production of precipitation at temperatures below and above 0°C, both in theory and in practice (with solid CO_2 or AgI). The experiments made in France, both in the laboratory and in the field with data on limiting conditions and actual conditions in flight, and success achieved for various types of clouds (40 cases—3 in Morocco, 6 in Tunisia and 31 near Paris) are reviewed. Pt. III comprises a detailed, illustrated account of techniques employed (preparation, equipment, flight plan, etc.). The appendix gives nomograms for calculation of precipitable water from depth of clouds, temperature at base and top, and height of cloud base. *Subject Headings:* **1. Cloud physics 2. Cloud seeding techniques 3. France.**—*M.R.*

6J–32 551.509.67

Flohn, Hermann, **Künstliche Erzeugung von Regen?** [Artificial rain making?] *Naturwissenschaftliche Rundschau*, 3(2):78–79, Feb. **1950. DA**—A brief and critical review of various attempts made in the United States, South Africa and Australia to produce artificial precipitation. German work on the formation of ice crystals under experimental conditions, under natural conditions in clouds (H. Weickmann) and in supercooled ground fog (E. Wall), and seeding with silver iodide and dry ice in the United States are discussed. The author concludes that artificial rain can be produced only from such clouds which would yield rain naturally. Of significance is the proportion of ice crystals to supercooled water drops in the cloud; the most favorable rates for the production of rain is $1:10^3$. (*Same item as* 2.4–39, April 1951, *MAB.*) *Subject Heading:* **1. Artificial precipitation.**—*I.L.D.*

6J–33 551.509.67

Gabites, J. F., **Artificial stimulation of rainfall.** *New Zealand. Meteorological Office, Circular Note*, No. 66, Nov. 13, **1950.** 6 p. 9 refs. **DWB**—Clouds whose tops have temperatures between 0°C and −10°C or −15°C normally contain supercooled liquid water droplets. The introduction of suitable sublimation nuclei such as silver iodide crystals, or the formation of ice crystals following the passage of pellets of solid carbon dioxide, results in a change from a liquid to an ice crystal cloud. In favorable conditions, large snowflakes may form and melt into raindrops, resulting in the dissipation of the cloud as a trail of precipitation, some of which may reach the ground. Nucleation with silver iodide smoke from the ground is cheap but offers little control of the time or place of the cloud seeding. If no favorable opportunities are to be lost, seeding from aircraft becomes necessary. It is estimated that the average rainfall over the Taupo Catchment could be increased by an amount of the order of one tenth of one per cent, with a value in terms of electricity of the order of £2000 per annum. The cost of the operation would probably exceed this figure several fold. (*Same item as* 5.5–75, May 1954 and 6F–57, June 1955, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding with silver iodide 3. Taupo Catchment, New Zealand.**—*Author's abstract.*

6J–34 551.509.67:016

†Kramer, Harris P. and Rigby, Malcolm, **Selective annotated bibliography on cloud physics and "rain making."** *Meteorological Abstracts and Bibliography*, Boston, 1(3):174–205, March **1950.** 204 refs. **DWB**—Items C–101 to C–204 comprise annotated references to "rainmaking and artificial

ucleation of clouds." There are 19 items for the period 1891–1945 (giving the principal points of nterest in the history of rainmaking) and 85 for 1946–1950. These 104 references are not being epeated in our present bibliography and therefore should be considered as supplementary to it. *Same item as* 6F–62, July 1955, *MAB.*) *Subject Heading:* **1. Weather modification bibliographies.** *–G.T.*

6J–35 551.509.67

Langmuir, Irving, **Control of precipitation from cumulus clouds by various seeding techniques.** *cience*, 112(2898):35–41, July 14, **1950.** 3 refs., 4 eqs. **DLC**—This substantial paper contains lucid description of physical processes leading to precipitation formation from cumulus clouds; ffects of dry ice seeding; factors to be considered in choosing time and place for seeding operations; ne author's "cause and effect versus probability" theory; and discussion and evaluation of cloud eeding experiments by means of silver iodide carried out near Albuquerque, N. M., in Oct. 1948 nd July 1949. The author claims both immediate and prolonged effects and considers the possibility f a modification of climate on a continental scale. He also believes that hurricanes can probably e modified by seeding large clouds which tend to grow into incipient hurricanes. *Subject Headings:* **. Cloud seeding in New Mexico 2. Hurricane control 3. Albuquerque, N. M.**—*G.T.*

6J–36 551.509.67:517.512.2

Langmuir, Irving, **A seven-day periodicity in weather in United States during April, 1950.** *American Meteorological Society, Bulletin*, 31(10):386–387, Dec. **1950.** 2 tables, 2 eqs. Also: ewis, William, **On a seven-day periodicity.** *Ibid.*, 32(5):192, May **1951.** table. **DWB**—LANG-IUIR asserts that a seven-day periodicity was introduced into the weather in the United States uring April 1950 by silver iodide from a ground-based generator. Temperature data at 850 mb evel over Chicago, April 2–29, 1950 are analyzed by the Fisher F-test. The odds against the existing -day periodicity being the result of chance are two million to one. At the same time correlation oefficients for temperatures at 850 mb in excess of +0.5 occurred over an area of 1,300,000 sq mi rom Oklahoma to Washington, D. C. A specific procedure for evaluating the results of periodic eedings is outlined. In his note, LEWIS states that he examined free-air temperature data for March, April and May for the period 1938 through 1942 at Chicago, Joliet and Bismarck according to the rocedure suggested by LANGMUIR. Using the criterion of significance established by LANGMUIR, even-day periodicities were found in 2 of the 5 spring seasons examined. (*Same items as* 2.7–52 nd 3.4–157, July 1951 and April 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding evaluation . Cloud seeding periodicities 3. Temperature periodicities.**—*I.L.D.*

6J–37 551.509.67

Pierson, Willard J., Jr., **Large scale control of weather by introduction of sublimation nuclei nto the atmosphere.** *New York Academy of Sciences, Transactions*, 2nd Ser., 12(8):268–270, June **1950. DLC**—A critical discussion of several instances in which rainfall was produced presumably y seeding of clouds with AgI. Of a case (*Life*, Feb. 20, 1950) in which a cloud 25 miles away from he AgI generator gave rise to a full scale thunderstorm, it is shown that surface and vertical wind elocity are such as to have prevented the AgI from reaching atmospheric levels where it could ecome effective. In the other instance which involved rainmaking over New York State (April 25, 6, 1950) the air into which AgI was released was capped by an inversion and the prevailing lapse ates would have prevented the AgI from reaching the freezing level where it becomes effective. (*Same item as* 3.3–80, March 1952, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud eeding with silver iodide 3. New York.**—*I.L.D.*

6J–38 551.509.67

Reichelderfer, F. W., **Can we change the weather?** *U. S. News and World Report*, March 3, **1950.** p. 19–20. 3 figs. **DWB**—A series of questions about rain making, cloud seeding, storm ontrol and climatic changes are answered by DR. REICHELDERFER, the Chief of the U. S. Weather Bureau. The conclusion is that experiments in cloud seeding, while at present not conclusive, may ead to results in prevention of thunderstorms or other incidental benefits, even though not resulting n economically important increase in rainfall. We do not know enough about climatic cycles and hanges to predict more than a month ahead with any skill. The work of the Weather Bureau in loud physics experiments and forecasting is outlined. (*Same item as* 3.1–66, Jan. 1952, *MAB.*) *Subject Headings:* **1. Weather control 2. Cloud seeding effects 3. Climatic changes 4. U. S. Weather Bureau.**—*M.R.*

6J–39 551.509.67

Richards, Leverett G., **They really make it rain.** *Country Gentleman*, Philadelphia, 120(7):19, 60–61, July **1950.** photo. Condensed in *Reader's Digest*, 57(339):63–67, July **1950. DLC**—Spectacular results of scientific and commercial weather modification and hail control, obtained by

means of dry-ice and silver-iodide seeding, are referred to with hopeful enthusiasm (experiments in tropical regions, results of Project Cirrus, KRICK's successful operations, etc.). Against the background of brilliant rainmaking achievement Weather Bureau pessimism is made to appear as unduly conservative. *Subject Heading:* **1. Weather control.**—*G.T.*

6J–40 551.509.67

Schaefer, Vincent J., **Economic aspects of experimental meteorology.** United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. **1949, Proceedings, v. 4, Water resources,** p. 2–27, **1951.** 23 figs., 29 refs. **DWB**—Also issued under title: **Experimental meteorology.** *Zeitschrift für angewandte Mathematik und Physik*, 1(3,4):153–184, 217–236, May 15, July 15, **1950.** 38 figs., 2 tables, 28 refs. **DLC**—A carefully prepared report with numerous photographs showing some effects of cloud seeding (dissipation or precipitation artificially induced), mostly with dry ice. A general review is given of nuclei in the atmosphere, causes of natural precipitation, fundamental experiments in cloud physics and requirements for cloud seeding. A diagram shows the temperature dependence for ice nuclei of different natural substances which may occur as aerosols in the atmosphere. The greatest activity occurs with solid CO_2 at 0°C or lower and, to a lesser degree, AgI which becomes fully active at −10°C. (For further details, *see items* C–185 and 2.3–128, March 1950 and March 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Cloud physics 3. Condensation nuclei.**—*A.A.*

6J–41 551.509.66:551.509.67:551.574.1

Schaefer, Vincent J., **The effects produced by seeding supercooled clouds with dry ice and silver iodide.** Royal Meteorological Society, **Centenary Proceedings 1950.** p. 42–50. 6 figs. 15 refs. **MH-BH**—After a historical introduction, the present field and laboratory studies by Project Cirrus are listed. Concentration of ice particles varies from less than 10 to more than $10^7/m^3$ at least 10^4 is required for cloud transformations to occur and persist. Results of seeding are described and illustrated by photos. The discussion, p. 63–65, is mainly on this paper. (*Same item as* 2.4–38, April 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Project Cirrus 3. Condensation nuclei.**

6J–42 551.509.67

Schaefer, Vincent J. and Vonnegut, Bernard (*Assignors to General Electric Co., New York*) **Method of crystal formation and precipitation.** *U. S. Patent Office, Patent* No. 2,527,230, Oct. 24 **1950.** [2 p.] refs. Also: Vonnegut, Bernard, **Method of generating silver iodide smoke.** *Ibid.* No. 2,527,231, Oct. 24, **1950.** [2 p.+plate] diagr., refs. **DP**—The first patent is based on an application of Jan. 21, 1948. It relates to a method for causing crystallization in supersaturated vapor containing gases, or in supercooled liquids, by the introduction of foreign nuclei of a designated crystalline structure. The second patent indicates a method for obtaining a large number of AgI particles by spraying a solution of AgI into a flame. The apparatus is shown in a diagram and the technique described in detail. *Subject Headings:* **1. Cloud seeding patents 2. Silver iodide generator patents 3. Patents.**—*G.T.*

6J–43 551.509.67:551.508.85

Smith, E. J., **Observation of precipitation with an airborne radar.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 3(2):214–223, June **1950.** 14 figs., plate, 2 tables 6 refs. **MH-BH**—Precipitation was induced artificially by seeding a cloud with dry ice. The precipitation was studied by means of a radar set, mounted in an aircraft, with beam directed downwards. The equipment and its installation are described and illustrated with photographs. The observed visual effects after seeding are given and the radar echoes are interpreted. Evidence is presented that the rain was formed from ice crystals produced by the seeding. (*Same item as* 2.8–43 Aug. 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding with dry ice 2. Radar analysis of rain.**—*I.L.D.*

6J–44 551.509.67:551.578.7

Thams, J. C., **Gli esperimenti swizzeri per combattere la grandine.** [Swiss experiments in hail control.] *Humus*, Milan, 6(4):23–25, April **1950.** figs. **DA**—Describes the hail control network set up as a 5-year experimental project in the Magadino plain. Operations comprise the following phases: 1) warning service, 2) protection service (by means of explosive rockets) and 3) reporting service. The network of the 50 launching sites is shown on maps. Results not yet available. *Subject Headings:* **1. Hail prevention in Switzerland 2. Magadino Plain, Switzerland.**—*G.T.*

6J–45 551.577.11:551.576:551.509.67

Vierhout, R. R., **On the formation of rain in clouds not reaching up to the freezing level.** *Journal of Meteorology*, 7(3):223–226, June **1950.** 3 refs., 8 eqs. **DWB, MH-BH**—Computations

made by the author indicate that LANGMUIR's chain reaction theory for precipitation formation in clouds seeded over Hawaii is not sufficient. An alternate explanation that falling dry ice pellets produce *evaporation* and resulting disturbances leading to coalescence is presented and suggested as mechanism whereby rain forms in the subtropics at levels below the zero isotherm. (*Same item as* 8–94, Aug. 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cloud seeding in Hawaii 3. Langmuir's theory 4. Rain from nonfreezing clouds 5. Hawaii.**—*M.R.*

6J–46 551.509.67

Vonnegut, Bernard, **Experiments with silver iodide smokes in the natural atmosphere.** *American Meteorological Society, Bulletin*, 31(5):151–157, May **1950.** 10 figs., 9 refs. **DWB**—Description of seeding experiments carried out from an airplane on Dec. 21, 1948, using AgI and dry ice alternately. Photographs of top of stratus deck after seeding show results. Preliminary experiments at tracing silver iodide smokes and ground released smokes, and apparatus used in dispensing chemicals for seeding purposes are also described. (*Same item as* 7–28, July 1950, *MAB.*) *Subject Heading:* **1. Cloud seeding with silver iodide.**—*M.R.*

6J–47 551.574.2:551.509.67

Vonnegut, Bernard, **Techniques for generating silver iodide smoke.** *Journal of Colloid Science*, 5(1):37–48, Feb. **1950.** 6 figs., 7 refs. **DLC**—Silver iodide smoke for seeding supercooled clouds may be generated by either a charcoal burning device (wherein the charcoal is impregnated with silver iodide) or a spray nozzle type smoke generator. Charcoal burners for ground or airplane use and a new turbo-jet burner for producing large numbers of particles are described. Methods of preparing solutions of AgI, numbers of nuclei produced per second, etc. are discussed. (*Same item as* 2.4–44, April 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding with silver iodide 2. Silver iodide smoke generators.**—*M.R.*

1951

6J–48 551.509.67

aufm Kampe, M. J. and Weickmann, Helmut K., **The effectiveness of natural and artificial aerosols as freezing nuclei.** *Journal of Meteorology*, 8(5):283–288, Oct. **1951.** 3 figs., 22 refs. Review entitled **Seeding Not Required** in: *Science News Letter*, 60(21):333, Nov. 24, **1951. DLC**—Measurements of the effectiveness of natural and artificial freezing-nuclei were carried out in a room-size cold chamber. The concentration of natural nuclei varied from approximately one per liter at about −13°C to 1000 per liter at −25°C. Since a concentration of 1 to 10 ice crystals per liter is sufficient to produce continuous precipitation, clouds which reach the temperature level of about −15°C should precipitate. In general, this is verified by the observations of several investigators. Investigations of the effectiveness of silver iodide and cobalt iodide indicate that cobalt iodide is almost as effective a freezing nucleus as is silver iodide. However, due to its high hygroscopicity, cobalt iodide probably cannot be used to seed clouds from the ground. The threshold temperature at which silver iodide and cobalt iodide are effective is approximately 10°C higher than that at which natural aerosols of well industrialized and populated regions are effective. Consequently, whenever synoptic situations for appreciable rain exist, it will probably rain without seeding. For special cases, however, seeding may produce noteworthy amounts of rain; but this rain is local and of short duration. (*Same item as* 3.4–183, April 1952, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Cloud seeding.**—*Authors' abstract.*

6J–49 551.509.67

Aujeszky, László, **A mesterséges esőkeltés kérdése.** [The problem of artificial precipitation.] (In: Aujeszky, L. et al., **Mezőgazdasági meteorológia.** [Agricultural meteorology.] Budapest, **1951.** p. 159–164. figs.) **DLC**—Atomic fission would be the only adequate source of energy for modifying dynamic processes in the atmosphere (as suggested by the author as early as 1930) but progress in the atomic field is not advanced enough for use in weather modification; moreover such use would probably be uneconomical. Cloud seeding with dry ice is an available technique of cloud modification (artificial precipitation, cloud and fog dispersal). The author reviews the theory of dry-ice seeding and results achieved (Project Cirrus, Australian experiments). Lightning prevention by seeding with ammonia is mentioned. Cloud seeding experiments are planned by the Hungarian Meteorological Institute. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding with dry ice 3. Lightning prevention.**—*G.T.*

6J–50 551.509.67

Beaumont, R. T., **An analysis of cloud-seeding operations in North Central Oregon.** *Oregon Agricultural Experiment Station, Corvallis, Circular of Information*, No. 503, Oct. **1951.** 5 p. 2 figs. **DWB.** Also his: **Report of the first year's analysis of cloud-seeding in North Central Oregon.** *Oregon Wheat Growers League, 24th Annual Meeting, Proceedings*, p. 133–149, **1951. DA**—Cloud seeding by a silver iodide ground generator operated from Sept. 1950 to June 1951 during actual or

probable storm conditions. Although 8 out of 10 months showed positive departures from precipitation amounts estimated statistically by means of control area, there was no definite evidence of a positive effect of the seeding operations. *Subject Headings:* **1. Cloud seeding in Oregon 2. Oregon.**—*A.A.*

6J–51 551.509.67

Bernacca, E., **I primi esperimenti italiani di pioggia artificiale sono stati eseguiti in Sardegna.** [The first Italian artificial precipitation experiments have been carried out in Sardinia.] *Terra e Sole*, Rome, No. 108:303–305, Aug. **1951.** diagrs. **DA**—Near some water reservoirs in Cagliari province cloud seeding operations were undertaken by means of balloon-borne dry ice and ground-based and balloon-borne silver iodide (equipment described and illustrated). From Feb. 17 to March 9, 1951 the height of water in one of the reservoirs was raised from 17 to 28 m. The rainfall obtained is attributed to the seeding operations, as nuclei counts were found too low for natural rain formation. *Subject Headings:* **1. Cloud seeding in Sardinia 2. Cagliari Province, Italy.**—*G.T.*

6J–52 551.509.67:34

Binzak, Paul; Buellesbach, Richard P. and Zirbel, Irving, **Rights of private land owners as against artificial rain makers.** *Marquette Law Review*, 34(4):262–275, Spring **1951.** refs. **DLC**—"If the owner of Blackacre, by seeding the clouds passing over his land, reduces the amount of rain which would normally fall on Whiteacre, what right in the owner of Whiteacre, if any, has been violated by such activity?" Seeking an answer the authors try to determine "whether or not a landowner has any rights in the clouds passing over his land and the resulting natural rainfall." By various analogies (illustrated with court decisions) the conclusion is reached that the rule of "reasonable user" should be applied. Thus the courts might be justified in ruling that any interference by private individuals with the development of rainfall is illegal. In view of possible significant economic benefits of weather modification activities, the authors believe that "it may be necessary to tolerate such activities, but only under some type of government supervision." *Subject Headings:* **1. Weather control legislation 2. Legal aspects of weather control.**—*G.T.*

6J–53 551.509.67 551.574.1

Braham, R. R.; Reynolds, S. E. and Harrell, J. H., Jr., **Possibilities for cloud seeding as determined by a study of cloud height versus precipitation.** *Journal of Meteorology*, 8(6):416–418, Dec. **1951.** fig., 2 tables, 4 refs. **MH-BH**—In New Mexico, with cloud-top temperature above −12°C no radar echoes were found, from −12° to −24°C only one-fifth of the clouds gave echoes. Below −24°C presence of CuNb increased frequency of echoes. Seeding from ground by AgI had no effect. For summer seeding to be effective, cloud must extend from below 14,000 ft to at least 22,000 ft. (*Same item as* 3.5–96, May 1952, *MAB.*) *Subject Headings:* **1. Radar echoes from clouds 2. Cloud physics 3. Cloud seeding 4. Cloud height.**—*C.E.P.B.*

6J–54 551.509.67

Coons, Richard D. and Gunn, Ross, **Relation of artificial cloud-modification to the production of precipitation.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 235–241. 8 figs., 15 refs.) **MH-BH**—History of theory and practice of cloud seeding is reviewed, conditions necessary for successful artificial precipitation outlined, and Cloud Physics Project of U. S. Weather Bureau, NACA and USAF described. Results of 170 controlled tests made by the Project (1947–49) in Ohio, Calif. and Alabama are analyzed. Verification was by radar, aerial photography and voice recordings of observers' notes as well as by a ground network of rainfall stations and upper air soundings (rawinsondes). A few successful attempts are described but more often the careful analysis of records showed that the actual precipitation was induced by natural processes, whereas the dry-ice seeding inhibited the development of cumulonimbus. The conclusion is that seeding produces disappointing results from a commercial standpoint but promises to be of considerable scientific value. (For fuller abstract *see item* 4.2–2, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. U. S. Weather Bureau Cloud Physics Project.**—*M.R.*

6J–55 551.509.67(676)

*Davies, D. A.; Hepburn, D. and Sansom, H. W., **Report on experiments at Kongwa on artificial stimulation of rain, Jan.–April, 1951.** *East Africa High Commission. Meteorological Department, Memoirs*, 2(9), **1951.** 31 p. diagrs., charts, bibliog. Price: 5/s. **DWB**—An area of 200 sq mi near Kongwa in Central Tanganyika, with a close network of 50 evenly spaced standard (5 in.) rain gages, was used to test the efficiency of silver iodide seeding techniques. Local pilot balloon observations, hourly records of clouds and weather conditions, and general synoptic conditions were considered for the seven periods during Jan.–April 1951. Two methods were used: 1) standard charcoal burner at ground level and 2) exploding AgI impregnated gunpowder at the freezing level (15,000 ft) in cumulus clouds. Conditions during each trial are carefully described and the results

summarized statistically. More attempts were unsuccessful than conclusively successful, but there was good evidence, based on 2 rain gages, that much of the rain stimulated fell outside of the test area, that more rain was stimulated by the balloon-bomb technique than by the ground generator method; and that attempts should be made in the future to avoid overseeding or delayed seeding. Furthermore, no upper air temperatures were available to determine exact height of freezing level. Whether or not seeding was responsible, crops were better in this area than in the two preceding years. Diagrams show location of rain gages, details of equipment and isohyets for several of the periods in relation to point of release of bombs. (*Same item as* 3.8–68, Aug. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding techniques 2. Cloud seeding with silver iodide 3. Cloud seeding in East Africa 4. Kongwa, Tanganyika, British East Africa. I. East Africa High Commission. Meteorological Dept.**—*M.R.*

6J–56 551.509.67:551.578.7

Dessens, H., **A la recherche d'une technique antigrêle.** [Searching for a hail control technique.] *Phytoma*, Paris, No. 32:18–20, Nov. **1951.** photo., diagr. **DA.** Also as *Puy de Dôme. Observatoire, Publications, Ser. B.*, No. 6, **1951.** 6 p. Mimeo. **DWB**—Describes laboratory experiments indicating the possible effectiveness of AgI nuclei for hail prevention by means of overseeding. Preliminary (not unfavorable) results of experiments recently started in the Pyrenees by means of six AgI generators are reported. *Subject Headings:* **1. Hail prevention in France 2. Cloud seeding with silver iodide 3. Overseeding with silver iodide.**—*G.T.*

6J–57 551.509.67

L'ensemencement des nuages. [Cloud seeding.] *Atomes*, Paris, 6(66):310, Sept. **1951. DLC**—Brief discussion of cloud seeding by means of silver iodide and two other nucleating agents: (1) sulfur trioxide seeded from an airplane at the rate of 4 kg per hr over 250 km, and yielding 5 to 10 times as much rain as AgI and (2) calcium chloride. One of the benefits of cloud seeding is seen in that frequent light rain is obtained instead of violent thundershowers. Successful cloud seeding will raise the engineering problem of constructing inexpensive dams and reservoirs in order to conserve the water obtained. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding with sulfur trioxide 3. Cloud seeding with calcium chloride.**—*G.T.*

6J–58 551.509.67:551.578.7

Facy, L., **Que faut-il penser de la lutte contre la grêle?** [What should we think of hail control?] *Phytoma*, Paris, No. 26:19–20, May **1951.** Also: Dehoey, —, **Extrait d'une communication.** [Summary of a communication on hail control.] *Ibid.*, p. 20–21. **DA**—Facy stresses the need for further research into the mechanism of hail formation, but nevertheless states that introduction of a large number of nuclei into a cloud before the formation of hailstones begins would decrease the probability of hailfall. Dehoey examines and rejects the possibility of an effect of purely explosive rockets on hail formation. *Subject Headings:* **1. Hail prevention 2. Overseeding.**—*G.T.*

6J–59 551.509.67

Gaviola, Enrique, **Sobre provocación artificial de la lluvia, prevención del granizo y balance hídrico regional.** [Artificial precipitation, hail prevention and the regional water balance.] *Ciencia e Investigación*, Buenos Aires, 7(12):531–542, Dec. **1951.** 3 figs., table, 8 refs. **DA**—This lecture is based on the author's own research into the mechanisms of rain formation, icing and hail formation, and on results obtained by the scientists of General Electric Research Laboratory. In connection with the theory of artificial precipitation the decisive role of convection is stressed. Problems of regional water balance as determined by dynamic and humidity conditions of the atmosphere are considered. *Subject Headings:* **1. Cloud physics 2. Artificial precipitation 3. Atmospheric water balance.**—*G.T.*

6J–60 551.509.67

Hall, W. Ferguson; Emmons, Gardner; Haurwitz, Bernhard et al., **Dr. Langmuir's article on precipitation control.** *Science*, 113(2929):189–192, Feb. 16, **1951. MH-BH**—Criticism is levelled at Langmuir's conclusion that the silver iodide seeded in tests carried out by him in New Mexico in 1948 and 1949 produced all of the rain in that state on the days of the seeding (*see item* 6J–35). In the opinion of the critics, Langmuir erroneously assumed that the distribution of rainfall is purely random and that adjacent areas are independent of one another, that he failed to consider the normal rainfall pattern before concluding that the correlation between the rainfall pattern on the days of seeding was higher than normal and that he has not demonstrated satisfactorily that the occurrence of rainfall coincided with the distribution of silver iodide in areas beyond the center of silver iodide generation. Moreover, it is contended that from purely physical reasoning, it is impossible to deduce conclusively the meteorological processes resulting from silver iodide introduction in the atmosphere and that the time of effectiveness of silver iodide has not been determined. (*Same*

item as 2.9–51, Sept. 1951, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Langmuir Irving.**—*I.L.D.*

6J–61 551.509.67:517.512.2

Hall, W. Ferguson (*U. S. W. B., Wash., D. C.*), **An evaluation of the technique of cloud seeding to date.** Washington, D. C., U. S. Weather Bureau, [1951]. 8 p. 4 figs. **DWB**—Presented at New York Academy of Science, Oct. 23, 1951. Statistical tests of 7-day periodicities in precipitation pressure differences across the Gulf Coast, temperature at 700 mb level over Omaha and other parameters which were found to have high correlation coefficients during the first phase of Project Cirrus' 7-day seeding by silver iodide at Socorro, N. Mex. (Dec. 1949–June 1951), show that equally high correlation coefficients have occurred frequently in the past 10 to 50 years. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding periodicities 3. Socorro, New Mexico 4. Project Cirrus.**—*M.R.*

6J–62 551.509.67:551.574.1

Houghton, Henry G., **An appraisal of cloud seeding as a means of increasing precipitation.** *American Meteorological Society, Bulletin*, 32(2):39–46, Feb. **1951.** 8 refs. **MH-BH**—A review of recent attempts to produce precipitation by artificial seeding of clouds, and the scientific basis for results or lack of results in various individual cases. The thermodynamic effects, the use of artificial versus natural nuclei, the seeding of clouds already precipitating and possible large-scale effects are considered. It is concluded that under certain conditions precipitation may be induced at an earlier stage than would occur naturally, but that no large-scale effects are likely. (*Same item as* 2.9–52, Sept. 1951, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding.**—*M.R.*

6J–63 551.509.67

Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** 80 p. figs., refs. In Hebrew; English summaries. **DWB**—A collection of papers presented at the first scientific meeting held under the sponsorship of the Rainfall Research Committee after the first year's efforts (April 16–17, 1950), in an attempt to review progress and define problems slated to be solved. Papers directly related to cloud seeding operations are abstracted under items 6J–66 and 6J–87. The foreword was written by Y. CARMON, head of the Rainfall Research Committee. (*Same item as* 5.4–71, April 1954, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Symposia 3. Israel. I. Zahavy, D. (*ed.*) II. Carmon, Y.**—*M.R.*

6J–64 551.509.67

Kastens, Merritt L., **Alteración a voluntad del estado del tiempo.** [Artificial modification of the weather.] *Scientia*, Valparaiso, Chile, 18(4):252–256, Dec. **1951.** table, refs. **DLC**—A review of the experiments in artificial rain inducement, conducted in the United States by LANGMUIR, SCHAEFER, VONNEGUT and others connected with Project Cirrus and the results in terms of changes in weather patterns and economic value of probable increase in rainfall in dry areas. Some of the technical aspects are reviewed. Legal aspects are discussed briefly. *Subject Headings:* **1. Weather control 2. Cloud seeding 3. Project Cirrus.**—*M.R.*

6J–65 551.509.67:551.578.46(788)

Krick, Irving P. (*Pasadena, Calif.*), **Snow pack increase in the Colorado Rockies by artificial nucleation.** *Western Snow Conference, 19th Annual Meeting, Victoria, B. C., April 1951, Proceedings*, p. 108–110. table. **DWB**—An attempt to increase snow pack was begun in Nov. 1950 in the upper Arkansas River Basin, and in other watersheds of Colorado from Jan. through April 1951. Silver iodide was used in all experiments. Success of method used evaluated by showing ratio of precipitation to water content of snow pack at Aspen, Colorado, for 1940–1950 and for Feb. 1, March 1 and April 1, 1951 showing record (or almost record) conditions for 1951. (*Same item as* 3.5–98, May 1952, *MAB.*) *Subject Headings:* **1. Artificial snow pack 2. Cloud seeding with silver iodide 3. Colorado.**—*M.R.*

6J–66 551.509.67

Krown, L., **Meteorological aspects of stimulating artificial precipitation in Israel.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 56–59. 5 refs. In Hebrew, English summary p. 15–16.) **DWB**—Meteorological conditions and extent of seeding necessary for the production of artificial rain and the results of 14 cloud seeding experiments in Israel are summarized. (*Same item as* 3.11–88, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding in Israel 2. Israel.**—*I.L.D.*

6J–67 551.577.36:551.509.67

Langmuir, Irving, **Cause and effect versus probability in shower production.** General Electric Research Laboratory, Schenectady, Contract DA-36-039-15345, Project Cirrus, Final Report

July 30, 1951. p. 228–231. 3 eqs. Also issued as its Occasional Report, No. 22, July 15, 1950. **DWB**—A brief report attempting to show that rainfall in New Mexico is not a result of cause and effect (which would mean that every shower could be forecast quantitatively) but of probability. This probability is increased by synoptic conditions, number of condensation nuclei, temperature, apse rate, water vapor content, etc. The average rainfall and number of stations reporting on July 3 and 10, 1949 given as proof of theory. Several formulas are presented for calculating the probability as affected by sublimation nuclei condentration. (*Same item as* 3.1–136 and 3.4-198, Jan. and April 1952, *MAB.*) *Subject Headings:* **1. Rainfall probability 2. Cloud seeding 3. Sublimation nuclei 4. New Mexico.**—*M.R.*

6J–68 551.509.67:551.577.11

Langmuir, Irving, **Cloud seeding by means of dry ice, silver iodide, and sodium chloride.** *New York Academy of Science, Transactions,* Ser. 2, 14(1):40–44, Nov. **1951.** 4 tables. **DWB**—The theory of precipitation formation and cloud seeding developed during recent years is summarized by the leading research scientist in this field. Effects of various cloud seeding experiments are discussed with special emphasis on the controversial experiments with silver iodide on Oct. 14, 1948 and July 21, 1949 in New Mexico, and on regular weekly silver iodide seedings in New Mexico started in Dec. 1949 and carried on for several months. The results of these periodic experiments are analyzed in terms of comparative precipitation and upper air temperature data which are found to show a definite periodicity following the rhythm of the experiments. (*Same item as* 3.10–88, Oct. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Cloud seeding in New Mexico 3. Rainfall periodicities 4. Upper air temperatures 5. New Mexico.**—*G.T.*

6J–69 551.509.67

Langmuir, Irving, **Progress in cloud modification by Project Cirrus.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project Cirrus, Final Report, Schenectady, July 30, **1951.** p. 204–227. 2 figs., 2 tables, 4 eqs. **DWB**—Development of rain from cumulus clouds is deduced from heating effect following the forming of ice crystals. By artificially introducing ice into the cloud the forming of ice crystals is claimed to be set off through chain reaction, if the artificial seeding is done under a proper synoptic situation and adequate concentration of sublimation nuclei. Introducing high concentrations of ice nuclei (overseeding) said to be best method to produce dissipation of large cumuli. Experiments by Project Cirrus in New Mexico in 1948 and 1949 mentioned as indicating that seeding increases the probability of rainfall. Statistical data presented *in extenso.* (*Same item as* 3.3–75, March 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding with dry ice 2. Cloud seeding in New Mexico 3. Project Cirrus 4. New Mexico.**—*G.T.*

6J–70 551.509.67

Langmuir, Irving, **Results of the seeding of cumulus clouds in New Mexico. A partial report on flight 45.** General Electric Research Laboratory, Contract DA-36-039-sc-15345. Project Cirrus, Final Report, Schenectady, July 30, **1951.** p. 259-278. 8 figs., table. **DWB**—A brief discussion of the same subject was given by author in a paper presented before the American Meteorological Society on Jan. 5, 1949. The present report refers to a letter of HARRY WEXLER from the U. S. Weather Bureau, received by the author, and rejects the suggestion that the seeding under discussion had no obvious effect on the resulting rain, which would have occurred anyway. Eight photographs are added to the report on the flight which included one seeding with silver iodide and three with dry ice. (*Same item as* 3.3–76, March 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Cloud seeding in New Mexico 3. Cloud photographs 4. New Mexico. I. Wexler, Harry.**—*G.T.*

6J–71 551.509.67

Langmuir, Irving, **Studies of tropical clouds.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project Cirrus, Final Report, Schenectady, July 30, **1951.** p. 279–295. **DWB**—Author found cloud formations in Honduras during the dry season to be particularly suited for seeding studies. Cooperating with JOE SILVERTHORNE of the United Fruit Company he carried out several experiments using single ice pellets, water or carbon dioxide both for stimulating and preventing rainfall. Several new techniques were introduced and tried out. Particularly good results are claimed to have been obtained from seeding with single pellets which are reported to have profoundly modified clouds. Motion pictures were made of unusual cloud formations and were used to study growth of cumulus when seeded or not seeded. Water scoop measurements made by plane are described. *Subject Headings:* **1. Cloud seeding techniques 2. Cloud seeding in Honduras 3. Cloud photography 4. Honduras.**—*G.T.*

6J–72 551.509.67(969)

Leopold, Luna B. and Mordy, Wendell, A., **1948–1949 trials of the Schaefer-Langmuir cloud-seeding technique in Hawaii.** *Tellus,* 3(1):44–52, Feb. **1951.** 3 tables, 7 refs. **MH-BH**—During

1948 and 1949 dry ice cloud seeding tests were made on six days over Lanai and on nine days over Molokai Island. The results are tabulated with great detail as to meteorological conditions, time, amount of CO_2 dropped, height and thickness of clouds, height and temperature of release and of cloud tops and rainfall (if any) as recorded at a fairly dense network of stations. During days when seeding occurred there was a higher frequency of heavy rains than on non-seeding days, and the heaviest rains seemed to be associated with sub-freezing cloud tops. (*Same item as* 3.1–64, Jan. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding in Hawaii 2. Hawaiian Islands.**—*M.R.*

6J–73 551.509.67

Pulvermacher, Keith, **Artificial rain in South Africa.** *Discovery*, London, 12(7):219–220, July **1951.** photo. **DA**—Reports cloud seeding experiments carried out in 1948, 1949 and 1950 by the South African Council for Scientific and Industrial Research. Although evidence produced by the experiments is not conclusive, the results achieved with ground-based silver iodide generators appear to be promising. *Subject Headings:* **1. Cloud seeding in South Africa 2. Union of South Africa.**—*G.T.*

6J–74 551.501.45:551.578:551.509.67

Resnick, Sol D. (*Colo. Agr. Exp. Sta. Ft Collins*), **Analysis of climatological data for the spring cloud-seeding period over North Central Colorado; preliminary report.** Fort Collins, Colorado Agricultural Research Foundation, July **1951.** 11 p. **DWB**—A statistical study was made of precipitation over the target area and a control area (1911–1951), snow pack over target and control area (1938–51) and the general rainfall pattern over the area west of the Mississippi. Results indicate that on control area 62% of normal precipitation occurred, whereas on target area only 52% of normal (March) fall. Snow water content in control area in March and April 1951 was 147%, and on target area 158% of 13-year normal. Snow pack increase is attributed to low temperatures. No improvement was seen, either in comparison with normal or with other areas of the west, as a result of seeding operations. (*Same item as* 4.4–81, April 1953, *MAB.*) *Subject Headings:* **1. Precipitation data analysis 2. Cloud seeding in Colorado 3. Colorado. I. Colorado Agricultural Experiment Station, Fort Collins II. Northern Colorado Natural Resources Association.**—*M.R.*

6J–75 551.576.11:629.13

Schaefer, Vincent J., **Localized effects induced by seeding supercooled clouds with dry ice and silver iodide.** *Western Snow Conference, 19th Annual Meeting, Victoria, B. C., July 1951, Proceedings.* p. I–XI. 20 refs. **DWB**—Author discusses seeding of clear air, stratus clouds, and cumulus clouds, over-seeding, and natural seeding including several recent experiments which proved successful from a scientific point of view. Seeding of clear areas produced large masses of fine ice crystals under certain conditions. When exhaust trails were being formed behind the plane, seeding of the clear air did not change the situation one way or another. Ice crystals found in vapor trails consisted of "small hexagonal columns and clustered columns which may have formed on frozen water drops from the condensation trails." (*Same item as* 2I–133, Sept. 1951, *MAB.*) *Subject Headings:* **1. Condensation trails 2. Cloud seeding effects.**—*M.R.*

6J–76 551.509.67

Schaefer, Vincent J. (*Assignor to General Electric Co., New York*), **Method of crystal formation and precipitation.** *U. S. Patent Office, Patent* No. 2,570–867, Oct. 9, **1951.** [3 p.] refs. **DP.** Also: **Rain-making method is now patented.** *Science Digest*, 31(1):94, **Jan. 1952. DLC**—The application for this patent was filed on Jan. 21, 1948. The document contains a detailed description of a method for producing minute crystals or nuclei in aerosols comprising supercooled liquid droplets, by seeding with a substance (such as dry ice) and thus producing zones of low temperature (such as −39°C). The note in *Science Digest* sums up the essential points of the invention. *Subject Headings:* **1. Cloud seeding patents 2. Patents.**—*G.T.*

6J–77 551.509.67:551.574.1

Schaefer, Vincent J., **Snow and its relationship to experimental meteorology.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 221–234. 17 figs., table, 43 refs.) **MH-BH**—The many and varied and often beautiful forms in which snow or ice may occur in nature are discussed and nicely illustrated, and the methods of preserving and photographing such forms or crystals mentioned. Seeding in nature (from Ci clouds or spontaneous freezing in supercooled clouds) and the time required for ice forms to fall, liquid water content of stratus or cumulus clouds, freezing nuclei and condensation nuclei necessary for precipitation, electrical properties of snow and charges in snow clouds, factors affecting supercooled clouds and, finally, the use of dry ice, silver iodide and other seeding methods to control weather: induce or prevent precipitation, snow, hail, thunderstorms, to dissipate clouds are adequately discussed and illustrated. Limitations

o success in seeding are outlined but the outlook described as hopeful for both scientific and practical urposes under certain specified and limited conditions. (*Same item as* 4.1–7, Jan. 1953, *MAB.*) *ubject Headings:* **1. Cloud seeding 2. Cloud physics 3. Weather control.**—*M.R.*

6J–78 551.577.2:551.509.67

Schwerdtfeger, Werner, **Gedanken über ein Ausgleichs-Prinzip des atmosphärischen Gesamtiederschlages.** [Idea on a smoothing principle for total atmospheric precipitation.] *Meteorlogische Rundschau,* 4(5–6):96–97, May–June **1951.** German and English summaries p. 96. **MH-H**—Author argues that the total annual precipitation over the globe is determined entirely by he incoming solar energy and is therefore nearly constant from year to year. Consequently, an rtificial increase of precipitation in one region can only be obtained at the expense of a decrease in ome other region. (*Same item as* 2.11–145, Nov. 1951, *MAB.*) *Subject Headings:* **1. Precipitation istribution 2. Artificial precipitation.**—*C.E.P.B.*

6J–79 551.509.67:551.582.1(459.1)

†Serra, Antonio, **La provocazione artificiale delle precipitazioni e sua possibilità di applicazione in ardegna.** [Artificial inducement of precipitation and its possible application in Sardinia.] *Rivista i Meteorologia Aeronautica,* 11(3/4):3–17, July–Dec. **1951.** 3 figs., 2 tables, 40 refs. Italian, rench, English and German summaries p. 3. **MH-BH**—The article begins with an extensive eview of early attempts at artificial production of precipitation and studies of cloud physics, and rogress in this field of applied meteorology since 1946. Laboratory and field experiments in the .S.A., Canada, Hawaii, France, Australia and South Africa are also reviewed and evaluated. The econd part of the article deals with general climatic conditions in Sardinia, orographic influences, revailing air flow, and frequencies of winds of various speeds from different directions in several arts of the island in relation to rainfall and, finally, the implications for experiments in artificial ain production. (*Same item as* 4.4–83, April 1953, *MAB.*) *Subject Headings:* **1. Weather control . Wind variations 3. Rainfall variations 4. Cloud seeding in Sardinia 5. Sardinia, Italy.**—*M.R.*

6J–80 551.509.66/7

Shellard, H. C. and Grant, D. R., **Results of an artificial nucleation experiment.** *Meteorological Magazine,* 80(951):253–255, Sept. **1951.** 4 photos. **MH-BH**—St. Cu. at 9000–9500 ft over S.E. ngland, March 9, 1951, was seeded with dry ice along three lines. Clear lanes developed and nerged and a wind shear occurred. Visual and radar photos given. Some snow fell in small flakes. *Same item as* 3.3–72, March 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding effects 2. Cloud eeding with dry ice 3. England.**—*C.E.P.B.*

6J–81 551.509.67

Troch, P. (*Mining Corp., Haut-Katanga*), **Provocation artificielle de pluie au Katanga.** [Artiial stimulation of rain at Katanga.] (In: Congrès Scientifique, Elizabethville, Belgian Congo, ug. 1950, **Comptes Rendus, vol. 2, Travaux de la Commission Géographique et Géologique,** pub. russels, [**1950?**] p. 250–268. 3 figs., 5 refs.) **DLC.** Also in: *Courier Agricole,* Leopoldville, 7(11):1–4, May 28, **1952.** 5 refs. **DA**—Summary in French in *Puy-de-Dome. Observatoire, ulletin,* [Ser. 2], No. 1:21–22, Jan./March **1954. MH-BH**—Cloud seeding experiments were onducted over the Lufira Basin, Katanga, in April 1950. Dry ice bombs were released at the top f developed cumuliform clouds and exploded approximately 300 m below. Two of the five flights ere unsuccessful owing to adverse meteorological conditions. The other flights gave satisfactory esults, especially the last one in which extensive precipitation was obtained from a high cumulus loud. The author believes that the cloud top would have developed into a false cirrus, had it not een for the seeding operation. Laboratory experiments are mentioned in which aerosols were roduced from germanium chloride. *Subject Headings:* **1. Cloud seeding in Belgian Congo 2. Cloud eeding evaluation 3. Katanga, Belgian Congo.**—*G.T.*

6J–82 551.509.67

U. S. Congress. Senate. Committee on Interior and Insular Affairs, **Weather control and ugmented potable water supply. Joint Hearings before Subcommittee of the Committees. 82nd ongress, first session on S.5 . . . S.222 and S.789.** Wash., D. C., Govt. Print. Off., **1951.** 353 p. gs., maps, charts, refs. **DLC**—A voluminous compilation of prepared statements, impromptu estimony and discussions of the scientific, commercial and legal aspects of rain making by CO_2 r AgI seeding of clouds and of other methods of increasing water supply, presented as transactions f the hearings which took place between March 14–19 and April 5, 1951 in Washington. Among hose who testified at some length were W. F. McDonald of the U. S. Weather Bureau, Prof. Houghton and Neuberger, Wallace Howell, Irving Krick, Vincent Schaefer and Bernard Vonnegut. The purpose of the bill is to establish federal control over rain making activities.

(*Same item as* 3.5–103, May 1952, *MAB.*) *Subject Headings:* **1. Weather control legislation 2. Water supply 3. Congressional hearings. I. U. S. Congress. Senate. Committee on Interstate and Foreign Commerce II. U. S. Congress. Senate. Committee on Agriculture and Forestry III. Anderson, Clinton P.**—*M.R.*

6J–83 551.509.67

Violante, G., **Bilan des essais de pluie artificielle effectués et contrôlés par la Météorologie Nationale en Tunisie.** [Summary of artificial precipitation experiments carried out and evaluated by the Météorologie Nationale in Tunisia.] *Almanach Agricole Tunisien*, 1952:278–286. publ. **1951. DA**—In Tunisia 31 cloud seeding operations have been carried out by airplane since March 1948. Various seeding agents were used. Clouds connected with cold fronts were seeded on 21 occasions and yielded precipitation in 60% of the cases. Precipitation also occurred from the 2 thunderclouds seeded and from 40% of the other clouds treated. It is believed that Tunisia is favorable for cloud-seeding operations. *Subject Headings:* **1. Cloud seeding in Tunisia 2. Tunisia.**—*G.T.*

6J–84 551.509.67

Warren, Leslie A., **The practical aspects of cloud seeding as a means of causing or increasing precipitation.** *Rio Grande Water Forecast Committee, Second Annual Meeting, April 13, 1951 Proceedings.* Sept. **1951.** p. 8–13. **DWB**—Beginning with a statement of the official attitude of the Chief of the U. S. Weather Bureau in regard to the present status of rain making experiments by cloud seeding, the author goes on to quote several current opinions by research workers on both sides of the controversy including statements by HENRY G. HOUGHTON, WILLIAM LEWIS and VINCENT SCHAEFER. Exaggerated claims of success are discounted and the belief expressed that the possibilities will be known only after years of controlled tests in the field. (*Same item as* 3.5–106, May 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding 2. New Mexico. I. U. S. Weather Bureau**—*M.R.*

6J–85 551.509.67:551.577.1

Wexler, Harry, **Precipitation—natural and otherwise.** Washington, D. C., U. S. Weather Bureau, Sept. 20, **1951.** 12 p. 2 figs. **DWB**—In this speech given before the American Society of Agricultural Engineers at Houston, Texas, WEXLER describes in a lucid manner the status of experiments on artificial rainfall production in the United States and the theoretical basis for such tentative conclusions as may now be made. The difficulty in drawing conclusions regarding the practical value of single attempts or of a series of attempts at rainfall stimulation stem from the extreme natural variability of rainfall in both time and space and the difficulty in predicting rainfall from a single storm. (*Same item as* 3.5–107, May 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding evaluation. I. U. S. Weather Bureau.**—*M.R.*

6J–86 551.574.2:551.509.6

Woodman, Charles A. and Langmuir, Irving, **A gamma pattern seeding of stratus clouds flight 52 and a race track pattern seeding of stratus clouds, flight 53.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project DA 3-90-08-022, Project Cirrus, Final Report July 30, **1951.** p. 232–258. 10 figs. **DWB**—A detailed description of two dry ice cloud seeding flights following certain patterns on Nov. 24, 1948 near Schenectady, N. Y., is given, including weather conditions, process of flights, methods applied and results. The effect of the seeding in dispersing clouds along the course seeded, claimed to be spectacular, is shown in pictures taken after the seeding had been completed. (*Same item as* 3.4–189, April 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding with dry ice 2. Artificial cloud dispersal 3. Cloud photographs 4. New York**—*G.T.*

6J–87 551.509.67:551.574.

Zahavy, D., **Survey of research and experiments in artificial rain making.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 49–55. 23 refs. In Hebrew; English summary p. 13–14.) Also his: **Recent developments.** *Ibid.*, p. 60–63. 8 refs. English summary p. 16–17. **DWB**—Description of the basic ideas on rain formation, discussion of the action of AgI and of ice crystals in producing artificial rainfall and of the relationship of amount and type of precipitation to type of seeded clouds. VONNEGUT's AgI seeding experiments and the attitude of the American Meteorological Society towards rain making experiments are discussed briefly. Smoke generating activities from the ground were carried out in Israel in 1950–1951. Preliminary results indicate rainfall increase in the largest area. A single smoke generating operation from aircraft underneath a cumulus cloud was followed by heavy rainfall. (*Same item as* 4.1–73 and 4.1–74, Jan. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in Israel 2. Artificial precipitation 3. Israel.**—*I.L.D.*

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6J–88 551.509.67(729.1)

American Institute of Aerological Research, Denver, Colo., **A report on cloud seeding potentialities in Central Cuba, American Sugar Refining Company, Cunagua & Jaronu.** *American Institute of Aerological Research, Denver, Report,* No. 70, March 25, **1952.** 23 p. 7 figs., 2 tables, refs. **DLC**—A preliminary survey of climatic, orographic and other factors to be considered in planning cloud seeding operations for the benefit of the American Sugar Refining Corporation plantations in central Cuba. Relationship of rainfall (May–Oct.) to harvested cane, as shown in scatter diagrams, indicate 529–588 additional "arrobas per cab" for each additional inch of rain in range 25–50") at Cunagua and Jaronu, respectively. The basic cloud, precipitation, wind and weather patterns over Cuba are discussed. May through Oct. is recommended as most suitable season for ground AgI and occasional airplane seeding. Routine pilot balloon ascents and weather forecasts are required. Sites for most favorable location of generators are indicated. Motion picture cameras are needed for proving effectiveness. Seeding should be suspended during hurricanes. (*Same item as* 4.8–64, Aug. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cuba Cuba. I. Water Resources Development Corporation.**—*M.R.*

6J–89 551.509.67(794)

§*Battle, John A.; Jones, W. Floyd and Todd, Clement, **Cloud-seeding experiments in the San Diego County and the Santa Ana River Watershed, Nov. 1, 1951 through April 15, 1952.** Rev. ed. June 10, **1952.** [Pub. by Santa Ana River Weather Corporation.] 142 p. 88 figs., 7 plates, tables, ref. p. 2. Also: **Supplement, Nov. 1, 1951, through April 15, 1952.** (Rev. ed.). Oct. 1, **1952.** 7 p. tables, map. **DWB**—Statistical tests showed that about 20% more rain fell in the target area seeded by silver iodide particles than in a control zone. Chance of error 1:12 to 1:10,000. Statistical analysis is explained and actual data and scatter diagrams are given. Synoptic analysis of 2 single storms made, using tropospheric winds (2000 to 18,000 ft) as well as aerological data. (*Same item as* 5.1–93, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Synoptic studies 3. San Diego County, Calif. 4. Santa Ana River, Calif. I. San Diego County Weather Corporation II. Santa Ana River Weather Corporation.**—*A.A.*

6J–90 551.509.67:551.578.46

Beaumont, R. T.; Work, Robert A.; Frost, W. T. and Barton, Manes, **Use of snow surveys in evaluating cloud-seeding operations.** *Western Snow Conference, 20th, Sacramento, Calif., April 1952, Proceedings.* **1952.** p. 56–72. 7 figs., 6 tables, 21 refs. **DWB**—Water content in snow on target and control areas, located in Oregon, is compared for 10–19 years of observation. The resulting correlation is 0.80 or higher. Cloud seeding activities in 1949–51 are summarized and precipitation maps are shown. No evidence for a positive effect of cloud-seeding was found, but on the contrary a statistically significant decrease of the water-equivalent in comparison with the normal climatic regime was computed. *Subject Headings:* **1. Cloud seeding evaluation 2. Snow surveys 3. Oregon.** *A.A.*

6J–91 551.509.67

Behrman, Daniel, **Is artificial rain possible in the parched lands of Baluchistan?** *United Nations Educational, Scientific and Cultural Organization, Courier,* 5(7):11, July **1952.** 2 illus. **DWB**—Brief account of the activities of the Meteorological Department of the Government of Pakistan, which is supported by UNESCO. Particular attention is given to the research conducted by EDWARD FOURNIER D'ALBE (London), UNESCO representative and cloud physicist at the Meteorological Station of Quetta. Purpose of his investigation is to determine possibilities of artificial stimulation of rain in Pakistan. The station is equipped with simple homemade instruments, including a cascade impactor. (*Same item as* 4.3-84, March 1953, *MAB.*) *Subject Headings:* **Cloud seeding in Pakistan 2. Arid zones 3. Baluchistan, Pakistan. I. Fournier d'Albe, Edward.** *G.T.*

6J–92 551.509.67

Birstein, S. J. (*U. S. A. F., Cambridge Res. Ctr., Mass.*), **The effect of relative humidity on the nucleating properties of photolyzed silver iodide.** *American Meteorological Society, Bulletin,* 33(10):431–434, Dec. **1952.** 2 figs., table, 10 refs. **MH-BH**—Laboratory experiments on the effect of relative humidity or absorbed water vapor upon the photolysis and nucleating ability of AgI particles. In order to produce various degrees of relative humidity known amounts of water vapor are introduced into a stream of nitrogen passing over a AgI generator. The particles ranging from 0.004 to 0.4 micron were irradiated by UV for varying duration and injected into a cloud of supercooled water droplets. The results of experiments with varying degrees of relative humidity indicated that increasing relative humidity raises the resistance of AgI to destruction by UV light.

A possible mechanism for the phenomenon is discussed. (*Same item as* 4.8–65, Aug. 1953, *MAB*. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding with silver iodide 3. Cloud physic 4. Silver iodide properties.**—*I.L.D.*

6J–93 551.509.6

Blair, Richard, **Control of the weather.** *Discovery*, London, 13(4):113–114, April **1952.** photo **DLC**—In connection with recent weather control activities, the author discusses the effect of a increase or decrease in rainfall on the economic welfare of various regions throughout the worl He declares that while increasing precipitation would be vital for many regions, the reverse is th case for other areas. Guano production, the reduction of insects and diseases, the cultivation c certain fruits and crops and the tourtist trade call for diminished rainfall. A photograph showin South African scientists at work with a AgI generator is added. *Subject Heading:* **1. Weather contro** —*G.T.*

6J–94 551.509.67(8

*Boucher, Roland J., **Evaluation of cloud seeding activities in Peru. A. Cerro de Pasco wate shed, Sept. 1951–May 1952. B. Gildemeister watershed, Sept. 1951–June 1952.** Cambridg Mass., Wallace E. Howell Assoc., Inc. Dec. **1952.** 25+20 p. maps, figs., tables. **DWB**—Sum maries of generator operation, cloud motions during seeding, precipitation amount within the wate shed and in adjacent areas. Rainfall amount in target areas compared with control stations an with normal amounts, as well as river discharges in target area with control catchment areas. Sta tistical tests show positive effect of seeding in almost all cases, although with insufficient confidenc limit. (*Same item as* 4.11–85, Nov. 1953, *MAB*.) *Subject Headings:* **1. Cloud seeding in Per 2. Cerro de Pasco watershed, Peru 3. Chicama-Moche watershed, Peru. I. Howell, Wallace E Associates, Inc., Cambridge, Mass.**—*A.A.*

6J–95 551.509.6

Bowen, E. G., **Australian experiments in artificial rain-making.** *American Meteorologica Society, Bulletin*, 33(6):244–246, June **1952.** 4 refs. **MH-BH**—In this talk presented at a Weathe Bureau Seminar, Washington, D. C., Nov. 7, 1951, BOWEN discussed the pitfalls standing in the wa of the experimenter in artificial precipitation, the aim of Australian research on cloud seeding, an the results and achievements. The experiments, most of which were conducted with dry ice droppe into the tops of clouds from an airplane and the special cloud conditions under which operation were carried out, are described. Also silver iodide seeding experiments, weather conditions unde which dry ice seeding may be of value and the spraying of warm clouds with water in order to induc coalescence are discussed. (*Same item as* 4D–259, April 1953, *MAB*.) *Subject Headings:* **1. Clou seeding techniques 2. Cloud seeding in Australia 3. Australia.**—*I.L.D.*

6J–96 551.509.6

Bowen, E. G., **Australian experiments on artificial stimulation of rainfall.** *Weather*, 7(7):204 209, July **1952.** 2 figs., 2 photos, 6 refs. Also (with slight changes) in: *Australian Institute Agricultural Science, Journal*, 20(1):18–23, March **1954.** Also: **Australian experiments in rain making.** *Current Science*, Bangalore, 24(5):143, May **1955. DLC**—About 100 experiments led t the conclusion that "given suitable cloud conditions, it is tolerably certain that seeding with dr ice produces rain which could not otherwise have fallen." These conditions are defined by clou top temperature and cloud thickness. AgI requires lower temperature and is less effective. Wate drop spraying is also promising. Limit of possible increase of rain in S.E. Australia 5–10%, bu may be economically profitable in marginal wheat area. (The note in Current Science is a summar of the same information.) (*Same item as* 3.10–86, Oct. 1952, *MAB*.) *Subject Headings:* **1. Clou seeding with dry ice 2. Cloud seeding with water 3. Cloud seeding in Australia 4. Australi** —*C.E.P.B.*

6J–97 551.509.6

Bowen, E. G., **A new method of stimulating convective clouds to produce rain and hail.** *Roy Meteorological Society, Quarterly Journal*, 78(335):37–45, Jan. **1952.** 5 figs., 2 tables, 5 refs. **Revie** in: *Annalen der Meteorologie*, 5(1/2):45–46, **1952,** and in: *The Aeroplane*, London, 82(2117):18 Feb. 15, **1952. DWB**—Assuming that droplets, larger than existing natural ones but small enoug to be carried up, will grow by coalescence, calculations show that droplets of diameter about 50 introduced into base of a convective cloud will fall out after 20–60 min with a diameter more tha 1 mm. Experiments with spraying from an aircraft were made at Sydney, Australia. In clou less than 5000 ft thick, 6 produced virga of a few drops less than 0.5 mm and one had no resul In cloud more than 5000 ft thick, 1 light, 2 heavy and 1 very heavy showers occurred. In 8 of 1 cases the cloud dissipated. (*Same item as* 3.4–90, April 1952, *MAB*.) *Subject Headings:* **1. Clou seeding techniques 2. Cloud seeding in Australia 3. Sydney, Australia.**—*C.E.P.B.*

6J–98 551.509.67:519.24(791)

Brier, Glenn W. and Enger, Isadore (*U. S. W. B., Wash., D. C.*), **An analysis of the results of e 1951 cloud seeding operations in central Arizona.** *American Meteorological Society, Bulletin*, (5):208–210, May **1952.** 2 figs., 2 tables. **MH-BH**—An independent statistical analysis of the periment of P. H. MacCready, Jr. on cloud seeding in central Arizona during 1951. A more mplete network of stations, more past data and slightly different statistical techniques were used. n the basis of a 31-year record, precipitation in the seeded area in 1951 was larger than normal; owever the departure from the regression time was not significant, the t-test indicating 18 chances ut of a 100 of obtaining a positive departure of this magnitude from the regression line. Adding ore stations with at least 10 years of record gave a highly significant departure ($P < 0.01$) for the 51 value. Using only the last 10 years of data gave a probability of 0.08 (compared with 0.18 th 31-year record). The "significance of the result depends on both the network of stations and e length of record available. (*Same item as* 4.2–67, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud eding in Arizona 2. Cloud seeding evaluation 3. Statistical techniques 4. Arizona. I. Mac-eady, P. H., Jr.**—*I.L.D.*

6J–99 551.509.67:711

Clawson, Marion (*Bureau of Land Management, U. S. Dept. Interior*), **Land use potentialities artificially-induced precipitation in the western United States.** *Land Economics*, Madison, Wisc., (1):54–62, Feb. **1952. DA**—Without attempting to decide the controversial issue of an efficacy inefficacy of weather modification efforts, the author assumes that such efforts might, under some rcumstances, increase the general precipitation amount over wide areas. Effects of such an even-al increase on the growth of various crops, on stream flow, on erosion, on land use, and on various ograms are considered. *Subject Headings:* **1. Effects of rainfall increase 2. Weather control nefits 3. Land utilizatization.**—*G.T.*

6J–100 551.509.67:551.578.7

Consorzio Volontario Sperimentazione Lotta Antigrandine di Cenate, **Relazione sullo svol-mento dell'esperimento di difesa antigrandine attuato nell'anno 1950 . . . in provincia di Bergamo.** Report on hail control experiments in Bergamo Province in 1950.] Bergamo [1951?] 45 p. agr. maps. Also its: **Relazione sullo svolgimento della lotta contro la grandine nel suo secondo no di esperimento in provincia di Bergamo.** [Report on the second year of hail control experi-ents in Bergamo Province.] Bergamo, [1952?] 40 p. **DA**—These reports contain detailed counts by the groups participating in the hail control activities of Bergamo Province in 1950 and 51. Diaries of storms and operations, maps showing launching locations and synoptic situations, d quotations of newspaper articles are included. The results are summed up by Gino Sartori, o was in charge of the project. The technique employed (explosive rockets) was found to be finitely successful, yet subject to further improvement. *Subject Headings:* **1. Hail prevention in ly 2. Bergamo Province, Italy. I. Sartori, Gino.**—*G.T.*

6J–101 551.509.67

Davies, D. A., **Artificial stimulation of rain at Kongwa.** *Nature*, London, 167(4250):614–615, pril 14, 1951 and 169(4311):1001–1002, June 14, 1952. 2 refs. **DLC**—The first article describes o methods used in East Africa to produce particles of AgI by burning charcoal impregnated with etone solution of AgI and by exploding small charges of impregnated gunpowder. The charges e carried by hydrogen balloons into suitable clouds and released at freezing level by time fuses. ne second paper is an account of proposed experiments in which a mixture of particles of sea salt d calcium chloride is carried by balloon into nonfreezing clouds and scattered by explosion. (*Same ms as* 3.5–97 and 3.10–87, May and Oct. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding chniques 2. Cloud seeding with silver iodide 3. Cloud seeding with salt 4. Cloud seeding in ast Africa 5. Kongwa, Tanganyika.**—*C.E.P.B.*

6J–102 551.509.67

Davies, D. A. (*E. African Met. Service*), **Artificial stimulation of rainfall.** *South African Journal Science*, Johannesburg, 49(2):45–48, Sept. **1952. DWB**—After a general survey of theoretical d experimental progress in cloud seeding, the author describes the experiments conducted at ongwa, Tanganyika during the period Jan.–April 1951. In these experiments the "balloon-mb" technique was applied, which involves the launching of hydrogen balloons carrying small arges of gunpowder to explode at an altitude of about 15,000 ft above mean sea level. By this ethod the seeding material is carried directly into the cloud, which is one of the advantages over the ound-generator technique. Effects of the seeding were observed over a network of 50 rain gages stributed over a 200 sq mi area. Out of 27 days when successful operations were expected, 12 ere "probably unsuccessful," 10 "inconclusive" and only 5 "probably successful." The analysis total rainfall data and their comparison with data from surrounding unseeded areas showed

equally poor results. Further experiments with the "balloon-bomb" are in progress. (*Same item a* 4.8–68, Aug. 1953, *M.A.B.*) *Subject Headings:* **1. Cloud seeding in East Africa 2. Balloon bom technique 3. Cloud seeding evaluation 4. Kongwa, Tanganyika.**—*G.T.*

6J–103 551.509.67:551.578.

Dessens, Henri (*Puy-de-Dôme Obs.*), **Étude de quelques tentatives pour provoquer la plui ou éviter la grêle.** [Study on some efforts to cause rain or to prevent hail.] *Société des Science Naturelles du Maroc, Comptes Rendus des Séances Mensuelles*, No. 3:71–72, **1952.** Stamped on t-p *Puy-de-Dôme. Observatoire, Publications, Sér. B*, No. 5, **1952.** Abstracted from reprint. **DWB**— Note on cloud studies and rain making experiments conducted at Puy-de-Dôme Observatory. Th note is based on a lecture delivered at a meeting of the Society of Natural Sciences of Morocco a Casablanca on March 7, 1952. The author compares the present state of the science of rain makin to that of broadcasting in 1900. Chief difficulty is the lack of conclusive control methods. At th Observatory extensive use is made of photometric control techniques. Silver iodide cloud seedin experiments conducted so far appear to have had noticeable effects. A planned set-up of 20 gen erators is announced for hail prevention experiments to be conducted in 1952. (*Same item a* 4.8–69, Aug. 1953, *M.A.B.*) *Subject Headings:* **1. Artificial precipitation 2. Hail prevention.**—*G.T*

6J–104 551.509.67(44

Dessens, Henri (*Dir. Puy-de-Dôme Observatory*), **Études sur les orages Pyrénéens. Deu campagnes d'insémination des nuages dans le Sud-Ouest.** [Studies on Pyrenees thunderstorms Two attempts at cloud seeding in the South-West.] *Puy-de-Dôme. Observatoire, Publication Ser. B*, No. 1, 1953. 7 p. 2 figs. Reprint from: *Pyrénées* [Pub. by Puy-de-Dôme Observatoire No. 12, Dec. **1952. DWB**—Report on the activity of the "Association for the Study of the Contro of Weather Disasters" from 1951 to 1952. A broad program for S. France was planned in order t prevent hail storms and even to modify tropical storms. Laboratory studies in cloud physics wer made, including methods to prevent coagulation. Field tests were rather disappointing. (*Sam item as* 5.2–75, Feb. 1954, *M.A.B.*) *Subject Headings:* **1. Weather control 2. Cloud seeding i Pyrenees 3. Pyrenees, France.**—*A.A.*

6J–105 551.509.65/6

Dessens, Henri, **Sur la microstructure et la précipitation artificielle d'un brouillard surfondu** [Microstructure and artificial precipitation of supercooled fog.] *Académie des Sciences, Paris Comptes Rendus*, 235(25):1675–1678, Dec. 22, **1952.** 2 figs., 4 refs. **DLC**—In supercooled city fo having a temperature around −5°C widely spaced needles will form naturally without affecting th fog's stability. Precipitation was obtained from such fog over an area of 2 km² by the release o 100 gm silver iodide; the operation and results are described and quantitative data presented *Subject Headings:* **1. Artificial fog dissipation 2. Supercooled fog 3. Cloud seeding with silve iodide.**—*Trans. of author's abstract.*

6J–106 551.509.6

Dufour, Louis, **Peut-on faire pleuvoir artificiellement?** [Can rain be made artificially? *Ciel et Terre*, 68(9/10):187–195, Sept./Oct. **1952.** Also in: *Belgium. Institut Royal Météorologiqu Publications, Ser. B*, No. 4, **1952. MH-BH**—Semi-popular lecture on recent theories on clou physics and on cloud seeding experiments conducted in various countries. The possibility of in creasing precipitation by cloud seeding is not yet established, because the conditions favoring effectiv seeding are practically the same as those leading to natural precipitation. "Industrial" practice o rainmaking is therefore a waste of money at this point. Author believes all such commercial effort should be discouraged and instead funds should be made available to cloud physicists who alon are likely to achieve positive results, even if success is not yet in view. (*Same item as* 4.10–8 October 1953, *M.A.B.*) *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

6J–107 551.509.6

Elliott, Robert D. (*N. American Weather Consultants*), **Methods of evaluation in cloud seedin** *Western Snow Conference, 20th, Sacramento, California, April 1952, Proceedings*, p. 73–79, 195 3 figs., 4 refs. **DWB**—Snow course water contents and rainfall amounts are compared for contr and target areas in the High Sierra, at San Diego and on the Bitterroot Mountains (Idaho). I practically all cases a positive effect of cloud seeding was found. (*Same item as* 5.5–74, May 195 *M.A.B.*) *Subject Headings:* **1. Cloud seeding evaluation 2. Cloud seeding.**—*A.A.*

6J–108 551.509.6

FIDO, FIDO burning bright. *Aeroplane*, London, 83(2157):696–697, 699, Nov. 21, 195 4 figs. **DLC**—A brief but informative account of the history of FIDO (Fog Investigation Dispers Operation) in connection with the last demonstration (Nov. 11, 1952) which was staged at Blac

ushe, Eng. FIDO was conceived in 1921 by Sir Napier Shaw and Prof. Lindemann (Lord herwell), but no experiments were undertaken until 1936. In 1942 Churchill ordered develop- ient work to be speeded up, and by 1943 several successful landings had been made by FIDO. n all, 2524 landings and 182 take-offs were made during the war, with a consumption of 37 million allons of fuel. Six airports were equipped for FIDO but after the war only 3 were maintained, nd from 1948–1952 only one landing was made by FIDO. During this year's test, 4 airliners ook off and landed to test passenger reaction, plane performance, turbulence, visibility, heat and noke drift. (*Same item as* 4.11–82, Nov. 1953, *MAB.*) *Subject Headings:* **1. Artificial fog dissi- ation 2. Aircraft landing aids 3. Fog Investigation Dispersal Operation (FIDO) 4. England.** —*M.R.*

6J–109 551.509.6

Flohn, Hermann, **Künstliche Beeinflussung von Wetter und Klima?** [Artificial influencing f weather and climate?] *Geographische Rundschau*, 4(2):47–52, Feb. **1952.** 17 refs. **DLC**— his general article discusses the processes of rain formation and the possibility of causing it, the ffect of great town fires during the war, atom bomb explosions, Russian hydrologic plans and effect f Gulf Stream. The possibility of large scale artificial changes of climate is minimized, though ecent warming of Arctic may be partly due to CO_2 from coal burning. Artificial changes of local imate by towns, forests, etc. undoubtedly occur. (*Same item as* 4.3–83, March 1953, *MAB.*) *ubject Headings:* **1. Artificial precipitation 2. Weather control.**—*C.E.P.B.*

6J–110 551.509.67

Gotaas, Y. and Hoem, V., **Problemet kunstig regn.** [The problem of artificial rain.] *Naturen*, 6(7):206–220, **1952.** 4 refs. **DWB**—A popular presentation of theories, methods and chemicals s employed in cloud seeding research in the U.S.A., Australia and Europe. Author used fire xtinguishers (containing carbonic acid which changes into carbon dioxide flakes of 1 mm in diameter pon passing through the narrow nozzle) with success in his cloud seeding experiments in Norway. lowever, like the experiments of other workers, evidence as to whether the observed precipitation iat followed actually was caused by the seeding or by natural causes is an open question. Lang- uir's experiments with seven-day periodical seeding are considered to be promising. (*Same item s* 4.9–55, Sept. 1953, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding in Norway.**—*W.N.*

6J–111 551.509.6:34

Guyer, E. H., **Weather control, Task Group Report. A report by Task Group E-24, Weather ontrol, presented on May 7, 1952, at the Annual Conference, Kansas City. . . .** *American Water Works Association, Baltimore, Journal*, 44(6):531–537, June **1952.** table, 7 refs. Photostat. **DWB**—General report on weather control, conducted in 20 of the 48 states. Legislation adopted y five states and has been considered by two others. Wyoming and Colorado already claim overeignty to their atmospheric moisture. *Subject Headings:* **1. Weather control legislation . United States.**—*A.A.*

6J–112 551.509.67

†Hall, W. Ferguson (*U. S. W. B., Wash., D. C.*), **Status of possibilities of artificial precipitation.** *merican Geophysical Union, Transactions*, 33(6):866–870, Dec. **1952.** 25 refs. **MH-BH**—Cloud eeding with dry ice or silver iodide is designed to increase the ice-crystal content of clouds containing upercooled liquid water droplets, and thereby to permit the growth of precipitation elements (snow- akes or raindrops) by diffusion from water droplets to the induced ice crystals. Uncertainties as o need for additional ice crystals in clouds of appreciable water content make it difficult to estimate he potential value of cloud seeding in producing increased precipitation. Tests thus far have nown that it is often possible to produce slight amounts of precipitation from the bases of clouds, he rain reaching the ground on some occasions. Further research, both in the field and in the aboratory, will be needed to determine quantitatively the significance of cloud seeding in augmenting he nation's water resources. A short bibliography is furnished. (*Same item as* 4.9–56, Sept. 953, *MAB.*) *Subject Heading:* **1. Artificial precipitation.**— *Author's abstract.*

6J–113 551.509.65

Harrison, Henry T. (*United Air Lines Weather Service*), **Results of 42 tests of Brandau-Kooser ethod of artificial fog dispersal (B-K Number 2).** United Air Lines, Inc., Sept. 2, **1952.** 9 p. 5 figs., tables, charts, photos. **DWB**—Report on tests "with a secret chemical" conducted during he period Nov. 18, 1950 to Nov. 24, 1951 by Harvey M. Brandau and Eugene K. Kooser of "Weather Control," Medford, under a contract with United Air Lines. The first 31 tests flown t Medford and Arcata airports showed considerable results, while the last 11, at Portland airport, ere utter failures and led to the discontinuation of the contract. Detailed evaluations of each

test and cumulative data on weather elements and seeding results are presented in tables and charts Three series of photographs illustrate fog dispersal. The method tested is judged "too uncertain in its present state of development to justify routine application for airline use." (*Same item a* 4.11-83, Nov. 1953, *MAB.*) *Subject Headings:* **1. Artificial fog dissipation 2. Cloud seeding I. United Air Lines, Inc.**—*G.T.*

6J–114 551.509.67:3

Harvard Univ. Graduate School of Public Administration, **Regulation of weather modificatio activities.** A report prepared in the Seminar in Land Use and Conservation Graduate School o Public Administration, Harvard University. May **1952.** 50 p. **DWB**—The basis for the regu lation of weather modification activities and the problems arising therefrom are examined from strictly legal point of view. On the assumption that a Weather Control Committee has bee established in accordance with the provision of the bill introduced by SEN. CLINTON F. ANDERSO in the 82nd Congress (S.222), the author examined the legal bases of the federal and state powe to regulate weather modification; and outlined the proposed organization and proposed regulation of the U. S. Weather Control Committee. (*Same item as* 6.6–130, June 1955, *MAB.*) *Subje Headings:* **1. Weather control legislation 2. U. S. Advisory Committee on Weather Control.**—*I.L.D*

6J–115 551.574.1:551.509.6

†Havens, Barrington S., (*comp.*) (*Gen. Elect. Res. Lab.*), **History of Project Cirrus.** Genera Electric Research Laboratory, Schenectady, N. Y., Contract DA-36-039-sc-15345, Report, No RL–756, July **1952.** 103 p. tables, 93 refs. p. 95–103. **DWB**—Covers the work of "Genera Electric" scientists in the "research study of cloud particles and cloud modifications," starting i 1940 (study of smoke particles) up to the establishment of Project Cirrus in Feb. 1947, and th activities under this contract up to its termination in 1952 (instrumentation, laboratory studies o ice nuclei, silver iodide, raindrops, condensation nuclei, electrical phenomena, etc., cirrus, stratu and cumulus studies, flight tests, hurricane and forest fire studies); actual discovery of the effec of dry ice or other cold materials on the nucleation of supercooled cloud particles in July 1946 b SCHAEFER, critical temperature for nucleation was found to be −38.9°C±0.1; discovery of th effect of silver iodide smoke by VONNEGUT in the fall of 1946; theoretical calculations made b LANGMUIR; first cloud seeding on Nov. 13, 1946 (SCHAEFER); discovery of dry ice effect on cloud having temperatures above the freezing point (LEOPOLD and HALSTEAD 1947) which resulted in th rain chain reaction theory of LANGMUIR. *Subject Headings:* **1. Cloud seeding research 2. Projec Cirrus. I. Langmuir, Irving II. Schaefer, Vincent J. III. Vonnegut, Bernard.**—*A.A.*

6J–116 551.577.33:551.509.6

Hawkins, H. F., Jr. (*Ext. Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and circula tion of May 1952, including a study of some recent periodicities.** *Monthly Weather Review*, 80(5) 82–87, May **1952.** 3 figs., 3 tables, 7 refs. **DWB**—Discussing a marked 7-day periodicity i precipitation amounts in May 1952 at Washington, D. C. and elsewhere in the eastern part of th U. S., the author mentions the fact that the May 1952 periodicity in Washington was greater tha the one in April and May 1950. This latter has been claimed to be a result of periodic seeding No periodic seeding was conducted in May 1952. *Subject Headings:* **1. Rainfall periodicitie 2. Cloud seeding effects.**—*G.T.*

6J–117 551.509.6

*§Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation report of 1951 rainfal stimulation program for the Francisco Sugar Company.** [1952?] 40×44 cm. unpaged. mostl charts (colored) with text, 8 tables. **DWB**—This de-luxe "atlas" presents the day by day result of the cloud seeding program conducted by HOWELL's company for the benefit of the Francisc Sugar Co. in the southeastern part of Camagüey Province, Cuba (south central coastal plains regio of Cuba), during Aug.–Nov. 1951. Large full-page isohyetal charts in color based on data fro 50 rain gages show the exact areas and amounts of precipitation which occurred in the region durin each 24-hour period, and in addition, hodographs show the pilot balloon drift as an indication of th direction the silver iodide drifted from the generators. Radiosonde and surface synoptic data ar also used in the summaries of daily meteorological conditions for the analyses which accompan each chart. A 29% total average increase of rain is claimed for the target area, above that on ad jacent areas. (*Same item as* 5.8–83, Aug. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cub 2. Camagüey Province, Cuba.**—*M.R.*

6J–118 551.509.67:551.577.2(71

§Howell, Wallace E., Associates, Inc., **Evaluation report of the cloud seeding project in th Province of Quebec, October–December, 1951.** Cambridge, Mass., [1952]. 15 p. 2 tables charts. **MH-BH**—A large and impressive presentation of the seeding activities, the meteorologica

onditions and the probable results of the seeding which was carried on in central Quebec by the Aluminum Co. of Canada and the Shawinigan Water Power Co. from Oct. 8, to Dec. 10, 1951. Seeding was conducted on 53 days and resulted in "1¼ inches of precipitable water" over 30,000 q mi, and about an in. for the 16,000 sq mi of the Shawinigan watershed." Daily amounts ranged rom 0 to .14 in. for 30,000 sq mi. Daily weather charts, fronts, soundings, isohyets and relation o seeding points and a full page of discussion on each situation are presented. Oct. and Nov. 941 (a year with heavy precipitation) is compared with Oct. and Nov. 1951 for evaluation. (*Same tem as* 3.10-89, Oct. 1952. *MAB.*) *Subject Headings:* **1. Cloud seeding in Quebec 2. Quebec, Canada.**—*M.R.*

6J–119 551.509.67

*Krick, Irving P., **Increasing water resources through weather modification.** *American Water Works Association, N. Y., Journal*, 44(11):996–1020, Nov. **1952.** 15 figs., 3 tables, 15 refs. Abtracted from reprint. **DLC**—The author, who controls almost all commercial cloud seeding operaions west of 95°W in the United States, outlines the basic principles of cloud seeding, explains the roduction of silver iodide nuclei by ground generators and the activity of field operations, and hows a number of cases where rainfall was up to 400% above normal, claiming this as an obvious uccess of cloud seeding. The cost of the project is less than 1% of the computed benefits. (*Same tem as* 5.2-78, Feb. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Western U. S. 2. Industrial neteorology 3. Western United States.**—*A.A.*

6J–120 551.509.67

Krick, Irving P. and Smith, T. B., **Some evaluations of sustained cloud-seeding operations.** *American Geophysical Union, Transactions*, 33(1):53–56, Feb. **1952.** 7 figs., 2 tables. Also: Summerset, John and Smith, T. B., **Discussion [of above article]**, *Ibid.*, 34(1):137–140, Feb. **1953.** igs., tables. **DWB**—Evaluation of silver iodide cloud seeding experiments carried out from July o Dec. 1950 in various western sections of the U. S. Comparison of precipitation with unseeded ontrol areas is made by means of correlations. Except for one case, the precipitation in the target rea was higher than in the control areas; but the results are within limits of error, except in July 950 in New Mexico. It is possible that cloud seeding not only increases the total rainfall amount, ut also distributes rainfall more uniformly over wide areas. SUMMERSET compares rainfall over arget area with unseeded areas immediately to the north and south and finds that "there is absolutely o indication of an effect due to seeding." SMITH agrees that cloud seeding is not effective enough o produce the percentage increase which would be necessary to prove an effectiveness by the sugested statistical method, but states that one of SUMMERSET's control areas believed to be unseeded, vas actually seeded. (*Same item as* 4.1–71, Jan. 1953 and 5.4-76, April 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Western U. S. 2. Cloud seeding evaluation 3. Western U. S.**—*A.A.*

6J–121 551.509.67

Ludlam, Frank Henry, (*Imperial College, London*), **The natural and artificial production of showers.** *International Union of Geodesy and Geophysics. Association of Meteorology, 9th, Brussels, Aug. 1951, Procès-Verbaux, Mémoires et Discussion*, p. 142–148. 3 figs. Its *AIM* no. 9/c. Also ssued as *Uppsala-Universitet. Meteorologiska Institutionen, Meddelande* No. 39. Abstracted from reprint. Also his: **Artificial and natural shower formation.** *Weather*, 7(7):199–204, July **1952.** 2 figs., photos. **DWB**—Sets out physics of growth of cloud particles exceeding critical diameter of .01 in., growth of ice crystals into hailstones and raindrops, and artificial shower stimulation by dry ice or AgI or by spraying large droplets into cloud base. *Subject Headings:* **1. Rain formation 2. Cloud seeding with dry ice 3. Cloud seeding with silver iodide 4. Cloud seeding with water.** —*C.E.P.B.*

6J–122 551.509.67(791)

MacCready, Paul B., Jr., **Results of cloud seeding in central Arizona, winter 1951.** *American Meteorological Society, Bulletin*, 33(2):48–52, Feb. **1952.** 2 figs., 4 refs. **MH-BH**—Cloud seeding operations were conducted during the winter of 1951 over an area of 10,000 sq mi in central Arizona. The normal precipitation in the target and control area for each month was calculated as follows: 'the sum of all monthly normals for the U. S. Weather Bureau stations in the area having normals n the published "Climatological Data" is divided into the sum of all monthly precipitation for those stations, and the ratio expressed as a percentage." And the percent of monthly normal precipitation in the control area was assumed to represent the estimate of naturally occurring percent of normal precipitation in the target area. The monthly increases in rainfall in the seeded region were respectively: 15% (Jan.), 31% (Feb.), 41% (March), 54% (April). The increase in precipitation was found to be roughly proportional to the amount of seeding equipment and its timing. A detailed analysis of the statistical basis for evaluating the effect of seeding is presented. (*Same item as* 3.11–90, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding in Arizona 2. Arizona.** —*I.L.D.*

6J–123 551.509.6

*North American Weather Consultants, Pasadena, Calif., **Report on cloud seeding operation in Santa Barbara County, Nov. 1951–May 1952. Prepared for the County of Santa Barbara.** *North American Weather Consultants, Report* 6-6, Aug. **1952.** 19 p. 36 figs., tables, refs. **DWB**—Precipitation during 6 months of cloud seeding operations (over 1000 hrs) was up to 320% above normal and 27% in excess of "natural" precipitation computed by means of an unaffected control area. The percentage of normal monthly and seasonal values of normal storms is shown on maps; meteorological storm analyses are made, and scatter diagrams compare target and control area precipitation. Cloud seeding was made by both ground and airplane generators. (*Same item as* 5.4-74, April 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Precipitation distribution 3. Santa Barbara County, Calif.**—*A.A.*

6J–124 551.509.67:

*North American Weather Consultants, Pasadena, Calif., **Report on cloud seeding operation in the southern Cascades, Nov. 1951–April 1952. Prepared for California Oregon Power Company.** *North American Weather Consultants, Pasadena, Calif., Report,* 6–8, Sept. **1952.** 37 p. 18 figs. numerous tables, 18 refs. **DWB**—This report covers the operation and evaluation of results of a cloud seeding program directed toward increasing snow pack in the Southern Cascades during the 1951–52 winter season. In this report appear discussions of: the physical processes of natural and artificially induced precipitation processes (sections 3 and 4); the instrumentation of the cloud seeding program (section 5); a summary of weather events during the program (section 6); and an evaluation of results (sections 7 and 8). It is concluded that during the 1951–52 season, cloud seeding increased snow pack in the target area by 33% above what could be expected on the basis of comparison with an historically related area to the north. Runoff appears to have been raised by about 25%. It is recommended that essentially the same seeding plan be followed for another year. (*Same item as* 5.1–98, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Cascade Mountains**—*Author's abstract.*

6J–125 551.509.67:551.576.1(09

"Project Cirrus"—the story of cloud seeding. *General Electric Review,* 55(6):8–26, Nov. **1952. DWB**—A complete history of the famous experiments of SCHAEFER and LANGMUIR in producing ice nuclei in a deep freeze by means of dry ice pellets or other cooling devices, or by means of silver iodide smoke, and in producing modification in natural supercooled clouds by similar means. The discovery was an outgrowth of contractual work by the General Electric scientists, beginning in 1940, on precipitation statics, aircraft icing and artificial smoke screens. The "cold box" experiment was made by SCHAEFER in 1946 and the first snow storm was produced Nov. 13, 1946. Project "Cirrus" began Aug. 25, 1947, although preliminary work had been done under contract with the U. S. Signal Corps, ONR and Air Force beginning Feb. 28, 1947. Results of operations in Central America, Hawaii, Puerto Rico, New Mexico and other places are outlined, and incidental physical and instrumental work described. Discovery of "periodicities" induced by periodic AgI seeding, hurricane and forest fire modification experiments, study of statistical significance of cloud seeding trials in New Mexico, modification of supercooled ground fogs, orographic thunderstorms, towering cumulus, etc., hail prevention legislation regarding rain making and other limitations to artificial rainfall operations are described. Many fine illustrations of cloud modification, instrumentation in the laboratory and on aircraft, etc. are included. (*Same item as* 4.9–58, Sept. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding research 2. Project Cirrus 3. Progress in weather control I. Langmuir, Irving II. Schaefer, Vincent J. III. Vonnegut, Bernard.**—*M.R.*

6J–126 551.509.6

Rain making with common salt. *Current Science,* Bangalore, 21(10):295. Oct. **1952. DWB**—Brief account of report by D. A. DAVIES of trials in East Africa (Nairobi) by Overseas Food Corporation using a mixture of 90% sea salt and 10% $CaCl_2$ ground to 0.5μ particle size. The salt is taken aloft in balloons which burst at base of Cu clouds (gunpowder with time fuse used for release). AgI is only effective in clouds below freezing. Hygroscopic particles may be effective above freezing and, hence, useful in seeding nonfreezing clouds in the tropics. (*Same item as* 4.9–60, Sept. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding with salt 2. Rain from nonfreezing clouds 3. East Africa. I. Davies, D. A.**—*M.R.*

6J–127 551.509.6(04

Reed, Dale, **Rain or shine, science slowly conquers the weather.** *Purdue Engineer,* 47(8):10–11, 26, 32, May **1952.** 6 photos. **DWB**—A popular article on modern methods of observing and forecasting the weather, including the radiosonde, automatic weather stations and cloud seeding to control weather. *Subject Headings:* **1. Weather forecasting 2. Weather control.**—*M.R.*

6J–128 551.579 551.509.67

§Reichelderfer, Francis W. (*U. S. W. B.*), **Physical basis of water supply for the United States.** (In: U. S. Congress. House. Committee on Interior and Insular Affairs, **Physical and Economic Foundation of Natural Resources,** Vol. 2:11–14, **1952.** graphs, charts.) **DWB**—Meteorological aspects which are important for the evaluation of the hydrologic cycle are summarized. The discussion is illustrated by maps (for the U. S.) of annual, winter, summer, Jan. and July precipitation, of minimum and maximum annual precipitation, annual evaporation from free water surfaces and sample maps of single storms. The general circulation is characterized by the normal pressure distribution over the Northern Hemisphere in Jan. A nomogram for the computation of storm runoff from precipitation, considering the season and the duration of the storm, is presented, as well as a nomogram showing the flood routing procedure for the Ohio River. Most of the discussion is devoted to artificially induced precipitation. The physical basis of the precipitation process is explained, the working hypothesis of the "rain increasers" outlined, and a sound scientific approach to the problem presented. (*Same item as* 5.9–257, Sept. 1954, *MAB.*) *Subject Headings:* **1. Hydrometeorology 2. Precipitation charts 3. Runoff forecasting 4. Artificial precipitation 5. United States. I. U. S. Congress. House Committee on Interior and Insular Affairs.**—*A.A.*

6J–129 551.509.67

Rosenan, Naftali, **A climatological analysis of cloud seeding experiments during the rainfall year 1950–51 in Israel.** Hakirya, Israel, Rainfall Research Committee, Aug. **1952.** Also his: **Climatological analysis of cloud seeding experiments during the second year of the experimental period, 1951/2, in Israel.** *Ibid.*, Dec. 1952. 6 p. ref., map. **DWB**—During the year 1950–51, 18 attempts were made to seed clouds with AgI smoke generated at the ground at Aeftsibah, Israel. The results were assessed by means of rainfall charts drawn on each of these 18 days, and comparison with random days where no seeding occurred. It appeared that on at least 6 occasions some increases, which did not occur normally, occurred downwind from the generator. Frequency analysis also shows a concentration of anomalous (increase) precipitation on seeding days. However, there is considerable variation in occurrence of precipitation on the 18 days seeding was carried out. During the 1951–52 season 27 seeding experiments were carried out. The tests show some evidence that experiments were successful. (*Same items as* 4.8–70 and 5.1–99, Aug. 1953 and Jan. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding in Israel 3. Israel. I. Israel Rainfall Research Committee.**—*M.R., A.A.*

6J–130 551.509.67

Ruby, F., **Étude sur l'action des fusées paragrêles explosives et à iodure d'argent.** [Study of the effect of explosive and silver-iodide hail control rockets.] *L'Agriculture Pratique*, 115(9): 419–422, Sept. **1951.** Also his: **Les méthodes actuelles et nouvelles de défense contre la grêle.** [Current and recent methods of hail control.] *Agriculture*, Paris, 16(135):133–136, May **1952.** figs. Also his: **Los nuevos métodos de defensa contra el pedrisco.** [New methods in hail control.] *Instituto Agricola Catalan de San Isidro, Barcelona, Revista*, 101(10, 11, 12):237–244, 267–271, 295–299, Oct., Nov., Dec. **1952. DA**—The process of hail formation and the mechanism through which hail control rockets are effective are described. It is estimated that during the 15 years of systematic hail control activities in France more than 50% of the hailstorms have been warded off. According to the second paper rockets dispersing silver iodide were introduced in Nov. 1950 and used twice in 1951. The purpose was to obtain intense rainfall in limited areas (such as 2 by 7 km) which was achieved in each case. Photographs showing hail control equipment are presented. The Catalan version contains generally the same information. *Subject Headings:* **1. Hail prevention in France 2. Silver iodide rockets 3. France.**—*G.T.*

6J–131 551.509.67(09)

Schaefer, Vincent J. (G.E. Co.), **Progress in control of meteorological factors.** (In: Pennsylvania Electric Association, Hydraulic Power Committee, **Symposium on climatic trends in Northeastern United States, April 22–23, 1952, Minutes. 1952.** p. 107–120. **Discussion.** *Ibid.*, p. 121–123.) **DWB**—Review of 5 years of laboratory and field work in experimental meteorology by SCHAEFER and colleagues at General Electric, especially in the fields of cloud physics, rain making, cloud and fog dispersal, study of nucleation and ice crystal growth, etc. at Mt. Washington, Schenectady and in New Mexico. In the discussion he mentions the weekly periodicities in rainfall which LANGMUIR hypothesized. (*Same item as* 6.3–87, March 1955, *MAB.*) *Subject Headings:* **1. Project Cirrus 2. Cloud seeding research 3. Progress in weather control.**—*M.R.*

6J–132 551.509.67:551.509.31(94)

*Smith, E. J. (*Univ. Grounds, Sydney*), **The influence of meteorological conditions on rainmaking in the Sydney area.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, Melbourne,

5(1):87–103, March **1952.** 9 figs., 5 tables. **MH-BH**—Between Jan. 1948 and June 30, 1950 88 flights were made within 150 mi of Sydney, Australia, to stimulate rainfall by artificial means These flights are tabulated and classified according to synoptic situation, height of freezing leve above or below normal, water content of cloud 2000 ft > freezing level, difference in height betwee 0 and +10°C isotherms. These criteria are correlated individually with relative success of attempt (whether rain was induced, reached the ground or not), and the most important criteria thus deter mined. High water content 2000 ft above freezing level was a good criteria for success, but ever better was a "rainmaking index" made up from synthesis of various parameters. For 1948, 194 and 1950 the number of possible days for rainmaking was 45, 33 and 8. Synoptic situations favor able for rainmaking are illustrated. Forecasts from synoptic charts alone are better indicatior than when yesterday's radiosonde data are used. Improvements might occur if today's ascen were available just prior to the flight. (*Same item as* 4.2–76, Feb. 1953, *MAB.*) *Subject Headings* **1. Cloud seeding in Australia 2. Cloud seeding evaluation 3. Sydney, Australia.**—*M.R.*

6J–133 551.509.6

*Taihoku, Formosa. Rain Stimulation Research Institute, **Condensed report on experiment of rain making over Sun-moon Lake.** (Taipei), Taiwan, China, May **1952.** 4 p. table (fold.) Mimeo. **DLC**—The Rain Stimulation Research Institute was organized in May 1951 under auspice of the Taiwan Power Co., Chinese Petroleum Corp. and Central Weather Bureau and a research laboratory set up at Chia Yee Solvent Works (in Formosa). A ground generator for AgI seedin was ready at the time of the report to be tested in the Sun-moon Lake Area. A locomotive was also used as a AgI smoke generator, with 5 tests at Chia Yee (results said to be favorable), about 4 tests made with both dry ice and AgI during 22 airplane flights from 10,500 to 16,500 ft from Jan 22, 1951 to April 1, 1952 are discussed and results tabulated. Report claims results are quite satis factory, but for tropical (warm) clouds AgI has little effect though saturated NaCl used in 2 flight gave satisfactory results. *Subject Headings:* **1. Cloud seeding on Formosa 2. Formosa.**—*M.R.*

6J–134 551.509.6

Thom, Herbert C. S. (*U. S. W. B., Wash., D. C.*), **The evaluation of cloud seeding operations** Paper presented at CBIAC Meeting at Portland, Oregon, Feb. 20, **1952.** 6 p. 2 figs. Typescript **DWB**—The methodological difficulties encountered in obtaining sensitive evaluation of attempt to increase precipitation by cloud seeding are discussed in nontechnical language. The target control area experiment involves a procedure in which the effect of seeding is compared with con current records over an area expected to have related amounts of precipitation. The normal pre cipitation to be expected on the target in relation to that received on the control depends upon the amount received on the control. The target-control area technique of evaluation is illustrated by means of a diagram and discussed in detail. (*Same item as* 4.8–71, Aug. 1953, *MAB.*) *Subject Heading:* **1. Cloud seeding evaluation.**—*I.L.D.*

6J–135 551.509.6

U. S. Dept. of the Interior. Committee for the Evaluation of Bonneville Power Administration Cloud-Seeding Operations in the United States Portion of the Pend Oreille River Basin, **Report** Pub. by the Dept., July **1952.** 94 p. 28 figs., 4 illus., maps, graphs, 15 refs. **DWB**—Statistical material related to the cloud seeding activities in western Montana, northern Idaho and the northeastern corner of Washington is presented and analyzed. In these experiments six AgI generators were operated from Sept. 21 to Sept. 30, 1951 for a total of 286 generator hours. The statistical study is based on precipitation and runoff data for the operation period which are compared with long period mean values. Probabilities of occurrence and significance of the results obtained are determined. Although some positive effect could be observed, the Committee states that more extensive material would be necessary in order to reach final conclusions. A paper by VINCENT J SCHAEFER on **The use of silver iodide particles for seeding supercooled clouds** is incorporated into the report. (*Same item as* 5.1–101, Jan. 1954, *MAB.*) *Subject Headings:* **1. Statistical techniques 2. Cloud seeding with silver iodide 3. Cloud seeding in Northwestern U. S. 4. Northwestern United States. I. Schaefer, V. J.**—*G.T.*

6J–136 551.509.6

†U. S. Weather Bureau, **Cloud seeding methods.** Washington, D. C., Feb. **1952.** 8 p. 21 refs **DWB**—Methods of seeding by dry ice, AgI and water drops (clouds above freezing) and techniques now in use to initiate precipitation more effectively are outlined. Design and evaluation of experiments depend on type and thickness of clouds, wind conditions and temperature of cloud base and top. Number of recent articles (1949–52) on cloud seeding are in the appended bibliography (*Same item as* 4.9–61, Sept. 1953, *MAB.*) *Subject Heading:* **1. Cloud seeding techniques.**—*M.R*

6J–137 551.509.67

U. S. Weather Bureau, **Tentative plans for Weather Bureau artificial cloud nucleation (ACN) roject.** Wash., D. C., Nov. **1952.** 18 p. diagr. Mimeo. **DWB**—An elaborate plan for testing ne effectiveness of cloud seeding by dry ice and silver iodide in the southwestern part of Wash-ngton State and northwestern Oregon is described. The Weather Bureau expects to conduct nese experiments with the help of the Navy, Signal Corps, NACA, CAA and the Air Navigation Development Board. Cloud drop spectra, temperature, liquid water content and ice crystal content f clouds and other data necessary to a study of the physics of rain formation will be obtained from ne air. A fixed network of rain gage stations will be used for each trial, and control days and control reas will be set aside for statistical evaluation. (*Same item as* 5.4–77, April 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Northwestern U. S. 2. Cloud seeding evaluation 3. Western Washington 4. Northwestern U.S.A.**—*M.R.*

6J–138 551.509.67

U. S. Weather Bureau. Scientific Services Division, **Evaluation of Dr. Langmuir's claims of roducing weekly cycles in weather by cloud seeding.** June 6, **1952.** 3 p. 2 refs. Mimeo. **DWB**—A brief official statement of the U. S. Weather Bureau. LANGMUIR's claims were examined n detail with negative results. (*Same item as* 4.4–84, April 1953, *MAB.*) *Subject Headings:* **. Cloud seeding evaluation 2. Cloud seeding periodicities 3. Cloud seeding effects 4. Lang-nuir, Irving.**—*A.A.*

6J–139 551.509.67

Veranneman, Norbert L., **Artificial release of precipitation, pt. 1.** *World Meteorological Or-anization, WMO Bulletin,* 1(2):44–45, July **1952. Pt. 2.** *Ibid.,* 1(3):64–76, Oct. **1952. DWB.** lso: Translation into Spanish as: **Precipitación artificial,** in *Revista Meteorológica del Peru,* Lima, (1):32–36, Dec. **1954. DWB**—Review of progress in cloud physics and artificial precipitation. 'opics covered are stability of clouds, natural rain formation processes, supercooling, ice crystals, fficiency of sublimation nuclei, choice of cloud to seed and verification of results. *Subject Headings:* **. Cloud physics 2. Artificial precipitation.**—*M.R.*

6J–140 551.509.67

Vonnegut, Bernard (*Genl. Elec. Co.*), **Cloud seeding.** *Scientific American,* 186(1):17–22, an. **1952.** 6 figs. **DLC, DWB**—The author sums up the theory and problems of cloud and pre-ipitation formation and cloud seeding and gives a survey of the history and results of Project Cirrus. A cloud chamber photograph, two excellent cloud photographs taken after seeding, an lectron microphotograph of particles in silver iodide smoke and a picture of airplane and equipment re presented and a study of ice crystal persistence due to dry ice and AgI shown in a graph. (*Same em as* 3.5–105, May 1952, *MAB.*) *Subject Headings:* **1. Cloud seeding research 2. Project Cirrus.** –*G.T.*

6J–141 551.574.2:551.509.67

Vonnegut, Bernard and Maynard, Kiah (*Genl. Elec. Res. Lab., Schenectady, N. Y.*), **Spray-ozzle type silver-iodide smoke generator for airplane use.** *American Meteorological Society, Bulletin,* 33(10):420–428, Dec. **1952.** 13 figs. **MH-BH**—A detailed description of air-borne spray ozzle type silver iodide generator with the aid of schematic diagrams and photographs is presented. t is so designed as to make the apparatus safe and to shield the flame from the air stream. This enerator is based upon an atomizing type of spray nozzle. A solution of AgI in acetone and sodium odide is atomized in the nozzle by means of a compressed inflammable gas such as hydrogen. The pray and gas are ignited and burn as a hot flame on issuing from nozzle; the AgI is vaporized and hen condensed as very fine particles. The installation of this generator and its application in eeding of cumulus clouds are described. (*Same item as* 4.8–63, Aug. 1953, *MAB.*) *Subject Head-ngs:* **1. Silver iodide smoke generators 2. Cloud seeding.**—*I.L.D.*

6J–142 551.509.67:633.1

Water Resources Development Corporation, Denver, Colo., **Analysis of cloud seeding operations or Tri-County Weather Research, Inc. Sept. 1950 through June 1951. Final Report.** *Water Resources Development Corporation, Denver, Report,* No. 103, **1952.** 31 p. figs., 5 tables. **DLC**—The contents of this report include: 1) a summary of the Weather Bureau's Crop Bulletin for Sept. 1950–July 30, 1951; 2) a description of the preparation for and conduction of a cloud seeding opera-ion; 3) location of the AgI generators operated for the benefit of the Tri-Counties Association Oregon and Washington); 4) a statistical study by means of regression equations of the relationship etween winter wheat yields in Morrow, Sherman and Gelliam Counties, Oregon and rainfall;) a summary of the precipitation data for the Tri-County Area for the period March 1950–June 951; and 6) a simple account of the technique of evaluating the effectiveness of cloud seeding.

(*Same item as* 4.10–86, Oct. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding techniques 2. Cloud seeding in Oregon 3. Wheat yield 4. Oregon.**—*I.L.D.*

6J–143 551.509.6

*§Weather Modification Company, Redlands, Calif., **Cloud seeding experiments in Santa Clara County, Dec. 1, 1951 through March 31, 1952.** 59 p. 27 figs., tables. **DWB**—Detailed report of cloud seeding operations by means of ground generators. Rainfall data for target and control areas are presented. Statistical tests show 10% increase over naturally expected rain, computed by means of regression formulas. Synoptic analysis given for each storm, based on synoptic charts tropospheric wind charts and ascent data. (*Same item as* 4.10–87, Oct. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Santa Clara County, Calif. I. Battle, John A. II. Jones W. Floyd III. Todd, Clement.**—*A.A.*

6J–144 551.509.6

*Weather Modification Company, Redlands, Calif., **Report of cloud seeding experiments for the Grand River Valley Weather Improvement Association, Lemmon, South Dakota, May 15 July 31, 1952.** 21 p. tables, diagrs. **DWB**—A serious attempt to test the effectiveness of cloud seeding. From ten years rainfall observations a regression equation was developed to compute the "natural" rainfall in the seeded target area from rainfall measurements in three control areas. The actual rainfall was 23% higher. Probability of chance 1:5. Over seven seasons would be necessary to raise the significance to 1:100. The report gives detailed actual data and computations and shows the operation of silver iodide ground generators according to weather conditions. (*Same item as* 4.10–88, Oct. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in South Dakota 2. Grand River Valley, So. Dakota. I. Battle, John A. II. Jones, W. Floyd III. Todd, Clement.**—*A.A.*

6J–145 551.509.6

Weickmann, Helmut K., **Das Problem der künstlichen Vermehrung von Aufgleitniederschlägen** [The problem of artificially increasing upglide rainfall.] *Germany. Deutscher Wetterdienst in der U.S.-Zone, Berichte*, No. 38:401–407, **1952.** 4 figs., 4 tables, 21 refs. German and English summaries p. 401. **DWB**—The precipitation due to a warm front upglide is analyzed. The possible effect of increasing the number of nuclei is discussed, but it is found that the rainfall intensity depends mainly on convergence. Nuclei are of secondary importance and can only increase precipitation locally when the upglide is irregular. (*Same item as* 4.2–77, Feb. 1953, *MAB.*) *Subject Heading:* **1. Artificial precipitation.**—*C.E.P.B.*

1953

6J–146 551.509.6

†Albani, Felix (*Argentine Nat. Met. Ser.*), **La modificación artificial de la precipitación.** [Artificial modification of precipitation.] *Meteoros*, Buenos Aires, 3(2/3):247–275, April/Sept. **1953** 82 refs. English summary p. 247. **DWB**—A comprehensive and critical review of the theoretical basis underlying the attempts to increase precipitation by cloud seeding and a description of the various attempts (both commercial and governmental) of cloud seeding made in different parts of the world to increase rainfall by different methods of cloud seeding. The author concludes that precipitation can be increased artificially under special climatic conditions as demonstrated by Canadian and Australian experiments. (*Same item as* 5.9–90, Sept. 1954, *MAB.*) *Subject Heading* **1. Cloud seeding.**—*I.L.D.*

6J–147 551.593.63:551.509.6

Alby, E., **Phénomènes optiques apparaissant dans les stratus surfondus traités par l'iodure d'argent.** [Optical phenomena visible in supercooled stratus seeded with silver iodide.] *Puy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 2:51–54, April **1953.** 2 figs., table, 6 refs. **DWB**—The optical phenomena discussed are as follows: halo of 22°, halo of 46°, parhelia and circumzenithal arc tengent with halo of 22° and solar columns. *Subject Headings:* **1. Halo observation 2. Cloud seeding with silver iodide.**—*I.L.D.*

6J–148 551.509.6

American Meteorological Society, **Statement on weather modification.** Its *Bulletin*, 34(5) 218–219, May **1953.** **DWB**—Seeding of supercooled clouds with dry ice and injection of small water drops or salt particles in the base of nonsupercooled cumulus clouds can initiate certain modifications within the cloud and sometimes trigger the release of precipitation. Poorer results are obtained with AgI. Statistical analyses have not shown a significant increase of precipitation by ground-based silver iodide seeding. Large scale weather modifications by cloud seeding are not proved. (*Same item as* 5.1–92, Jan. 1954, *MAB.*) *Subject Headings:* **1. Weather control 2. Cloud seeding.**—*A.A.*

6J–149 551.509.66

aufm Kampe, H. J.; Weickmann, H. K. and Kelly, J. J., **Seeding experiments in supercooled stratus clouds.** *U. S. Signal Corps Engineering Laboratories, Ft. Monmouth, N. J., Technical Memorandum*, No. 1576, Dec. 7, **1953.** 23 p. 80 figs., photos, diagrs. **DWB**—The procedure nd experimental results of a series of experiments in which supercooled stratus clouds were seeded rom aircraft with dry ice and silver iodide are presented. It was found that seeding with dry ice nodified a supercooled cloud layer to such an extent that ground becomes visible through parts of t, that overseeding is not as common as is generally assumed that, on the average, ground can be een within one half hour after seeding and that on the average a seeded line spreads within about ne half hour. Synoptic charts and photographs of stratus clouds before and after seeding are resented. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding with dry ice.** —*I.L.D.*

6J–150 551.509.67

Beaumont, R. T. (*Oregon Agri. Exp. Station, Medford*), **Cloud-seeding analysis in Oregon.** *American Meteorological Society, Bulletin*, 34(7):298–303, Sept. **1953.** 12 figs., 5 tables, 5 refs. **MH-BH**—Attempts by commercial cloud seeding operators to increase precipitation in the form of snow in the Southern Oregon Cascades during the winter months and precipitation in the Tri-Counties area of Oregon for a ten month period are evaluated by the method of comparing a target and control area. A statistical analysis of the data involving the use of regression curves between control and target areas failed to show a material increase of precipitation in the target areas through cloud seeding. The decrease in the total accumulative snowfall for two counties in the Southern Oregon Cascades is cited as the strongest evidence found in these analyses of a possible modification of precipitation that could be attributed to cloud seeding. (*Same item as* 5.9–91, Sept. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Oregon 2. Oregon.**—*I.L.D.*

6J–151 551.509.67:551.578.7

Bidault, G. (Casablanca), **Insémination des nuages à l'aide de mèches génératrices de fumées d'iodure d'argent.** [Cloud seeding by means of wicks producing silver iodide smoke.] *Puy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 4:91–96, Oct. **1953.** fig. Also appeared as: *Rabat, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météorologie, Recueil des Publications*, No. 8, **1953. DWB**—A new cloud seeding technique is described in detail. Cotton wicks of the commercial type used for petroleum lamps are filled with charcoal slices impregnated with AgI solution. The device is ignited and sent aloft by means of a balloon. As the cotton is slowly consumed the burning pieces of charcoal are dropped off one by one at approximate intervals of 200 m. Tests conducted with the device in the laboratory and under natural conditions (up to an altitude of 2000 m) are reported. It is believed that this technique will be particularly effective when applied to hail suppression on a local scale. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding techniques 3. Hail prevention.**—*G.T.*

6J–152 551.509.67

Bidault, G., **La pluie provoquée au Maroc.** [Artificial rainfall in Morocco.] *Rabat, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météorologie, Recueil des Publications*, No. 7, **1953. DWB.** Reprint from: *Société des Sciences Naturelles et Physiques du Maroc, Comptes Rendus*, No. 8:133–135, **1953.**—A brief review of the theories of rain formation of BERGERON, FINDEISEN, LANGMUIR, BOWEN and SCHAEFER are given. The results of the seeding of clouds with CO_2 and AgI are discussed; They indicate that seeding carried out in eastern Morocco (Oued-el-Abid Basin) produced a considerable increase in rainfall over the normal. *Subject Headings:* **1. Cloud seeding in French Morocco 2. French Morocco.**—*I.L.D.*

6J–153 551.509.67

Bollay, Ronald (*North American Weather Consultants, Pasadena, Calif.*), **Clouds with a silver lining.** *Electrical West*, San Francisco, 110(3):73–76, March **1953.** figs. **DLC**—In connection with AgI cloud seeding operations of western U. S. power companies, the author discusses general principles of rainfall modification, operational details and effective range of AgI generators, evaluation problems and the legal and economic aspects of cloud seeding. Charts and graphs computed by North American Weather Consultants are presented in evidence of successful seeding operations. *Subject Headings:* **1. Cloud seeding 2. Silver iodide smoke generators.**—*G.T.*

6J–154 551.509.67

Bonacina, L. C. W., **Rain making and its wider implications.** *Weather*, 8(7):216–217, July **1953. MH-BH**—Discussion of the possible repercussions of rainmaking on the general distribution of natural rainfall over the globe. (*Same item as* 4.11–84, Nov. 1953, *MAB.*) *Subject Heading:* **1. Weather control.**—*C.E.P.B.*

6J–155 551.577.2:551.510.42:551.590.2

Bowen, E. G., **The influence of meteoritic dust on rainfall.** *Australian Journal of Physics*, Melbourne, 6(4):490–497, Dec. 1953. 5 figs., 2 tables, 6 refs. Also: Swinbank, W. C., **Comments on paper by E. G. Bowen entitled "The influence. . . ."** *Ibid.*, 7(2):354–358, June 1954. 3 refs. Martyn, D. F., **Comments on a paper by E. G. Bowen entitled "The influence. . . ."** *Ibid.*, 7(2):358–364, June 1954. fig., table, 8 refs. Neumann, J., **Fluctuations of long-period accumulations of daily rainfall amounts.** *Ibid.*, 7(3):522–526, Sept. 1954. fig., 2 tables, 3 refs. **MH-BH**—1) An examination of daily average rainfall for Sydney, Australia for (a) 1859–1901 and (b) for 1902–1944, and comparable data from British Isles and elsewhere, leads E. G. BOWEN to advance the hypothesis that the source of anomalous rainfall peaks on or about the 12–13, 23 and 31st of Jan. is extraterrestrial, since the effect is worldwide. The fact that these peaks occur about 29 days after the meteor showers of Dec. 13–14, 22 and Jan. 3 leads him to believe that these showers of meteoric dust are responsible. About 10,000 tons of meteoric dust in the $<4\mu$ size ranges fall on the earth each day and the velocity of settling is <1 cm/sec below 100 km height, thus taking 30–50 days to settle to the 40,000 or 50,000 ft level where they could seed large Cu clouds. The high concentration of dust at the 100,000 ft level due to rapid deceleration of fall velocity seems to be highly correlated with occurrence of noctilucent clouds. The other three articles discuss some points of BOWEN's hypothesis. 1) In his "Comments . . . ," W. C. SWINBANK questions the BOWEN hypothesis on the ground that meteoric dust coming on a certain date each year should influence frequency rather than intensity of rainfall and this has not been demonstrated by BOWEN. Also evidence from the Krakatoa eruption was that dust of size comparable to BOWEN's meteoric dust persisted for weeks and caused no unusual disturbance of rainfall regime. In 2) D. F. MARTYN remarks that a "peak" normal rainfall for any given day can be found by searching for any excessive amount. If this excessive value is removed, the rainfall for that day may even be deficient below normal, as is the case with some of BOWEN's peaks which he ascribed to a regular fall of meteor dust on a given day. Other examples BOWEN cites may be due to natural weather singularities, some of which are cited for the British Isles. 3) J. NEUMANN considers shortcomings in BOWEN's hypothesis such as assigning major rainfall peaks to purely physical factors (falling of meteoric dust) and also lack of explanation concerning rain "troughs" or low rainfall amount totals. Instead he proposes "the hypothesis of random accumulations," which accounts for both major rainfall peaks and troughs, and "random fluctuation" as a reason for their periodicity. (*Same item as* 6I–69, Sept. 1955, *MAB.*) *Subject Headings:* **1. Meteoric dust effect on rainfall 2. Cloud seeding by meteoric dust 3. Bowen theory 4. Rainfall singularities 5. Noctilucent clouds 6. Sydney, Australia.**—*M.R.*

6J–156 551.509.6

*Buell, C. Eugene, **An evaluation of the results of cloud seeding in western New Mexico and southeastern Arizona during July and August, 1951 and 1952.** New Mexico. Univ. Contract Cwb-8161 and Contract Cwb-8305, Terminal Report, June 1953. 72 p. 24 tables, 5 figs., 3 refs. eqs. Shorter version in: *American Meteorological Society, Bulletin*, 36(1):6–15, Jan. 1955. fig. 8 tables, eqs. **DWB**—A new evaluation technique was developed since the usual method, comparing target with control area, was not applicable in this case due to extensive commercial seeding by KRICK and others. The rainfall index $\log\left(\frac{1000}{N}\sum_{i=1}^{N}\frac{R_i}{r_i}+1\right)$ (N = number of stations, r_i = station rainfall for the day, R_i = average for the month) was linearly correlated to the mixing ratio at 700 and 500 mb and the temperature difference between these levels. For this difference a negative correlation was found (contrary to common opinion), which was also verified for conditions in Florida. The result of the elaborate analysis: rainfall on seeding days might be a little increased (significance level 9%) but the effectiveness of the whole cloud seeding operation is probably nearly zero. (For earlier papers by Buell on this research, *see items* 4.8-67 and 4.11–86, Aug. and Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding in Southeastern U. S. 2. Cloud seeding evaluation.**—*A.A.*

6J–157 551.574.1:551.509.6

Byers, Horace R. (*Chicago Univ.*), **Rational approach to rain making.** *Indian Academy of Sciences, Bangalore, Proceedings, Sec. A*, 37(2):237–247, 1953. 3 figs., table, refs. p. 246–247. **DLC**—A review of the latest scientific experiments in artificial rain making and a survey of the principles of cloud physics involved. The two prevailing theories of precipitation formation in clouds, the BERGERON theory of ice crystal nucleation in supercooled portions of a cloud and the theory based on nucleation by oversize raindrops which can account for rain from nonfreezing clouds are especially emphasized. Tests to be conducted by the U. S. Weather Bureau in southwestern Washington State (and adjacent Oregon) with homogeneous rainfall patterns, and possible tests with non-homogeneous (convective) type rainfall are outlined critically. (*Same item as* 5.3–243, March

954, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud physics 3. Cloud seeding in orthwestern U. S.**—*M.R.*

6J–158 551.509.67

Dessens, H., **Action de l'iodure d'argent sur les stratus surfondus.** [Effect of silver iodide on ipercooled stratus.] *Puy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 2:33–40, April **1953.** 2 notos, 5 refs. **DWB**—Cloud seeding was carried out with an AgI generator during winter in the imagne Plain which stretches between the chain of Domes to the west and the Forez Mountains to the east. During the time of seeding the size of cloud droplets was such as not to favor natural recipitation. Precipitation occurred from stratus, thickness of 100 m, with −5.5°C and always the form of hexagonal columns or platelets. Precipitations of the order of cloud volumes of 1 km³ ere produced and the visibility at the ground was increased from 80 m. to 500 m. *Subject Headings:* **Cloud seeding with silver iodide 2. Limagne Plain, France.**—*I.L.D.*

6J–159 551.509.67:551.578.7

Dessens, H., **L'activité de l'Association d'Études des Moyens de Lutte contre les Fléaux tmosphériques en 1953.** [Activity of the Research Association for the Control of Weather Disters in 1953.] *Puy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 3:75–76, July **1953.** fig. **DWB**—urified wood charcoal is steeped for 20 to 30 min. in an acetone solution of NaI containing 20 gm. gI per litre. The carbon is uniformly impregnated to 1.5% of AgI (15 gm.) per kg. During 1953, st as in 1951 and 1952, the Association concentrated its efforts on hail prevention by AgI seeding n a large scale. Vonnegut type generators were discontinued because of difficulty in using simulneously and continuously for several days at 43 stations (shown on chart) on a 400 km line. A ew technique recommended by General Electric and used in Africa by G. Bidault has been modified r use in France during 1953. Most of the stations (36) are in the SW part of France. Seven are ound the Puy-de-Dôme Observatory. *Subject Headings:* **1. Cloud seeding in France 2. Hail revention in France 3. Cloud seeding with silver iodide.**—*M.R.*

6J–160 551.509.67

Dessens, Henry (*Dir. Puy-de-Dôme Obs.*), **Expériences de modification des nuages dans les yrenées.** [Experiences in cloud modification in the Pyrenees.] *I.U.G.G. Association of Meorology, Brussels, 1951, Procès-Verbaux des séances, Mémoires et discussion*, p. 149. pub. **1953. WB**—Short summary of paper, presented at meeting. The seeding with hygroscopic nuclei was ccomplished at 2000–3000 m in height, considering orographic conditions and prevailing wind rrents. *Subject Headings:* **1. Cloud seeding with hygroscopic nuclei 2. Condensation nuclei Pyrenees, France.**—*A.A.*

6J–161 551.509.67:551.578.7

Dessens, H., **Les problèmes de la défense contre la grêle.** [Problems of hail prevention.] *uy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 3:73–74, July **1953. DWB**—A report on the press nference held at Locarno, Switzerland, on June 8, 1953, at which time the results of 5 years of tensive research into the efficiency of hail shooting methods were reviewed. The experiments ere made on the Magadino Plain—a very fertile horticultural region 10 km long and 3 km wide, here hail often damages vineyards and tobacco plantations. The 1948–1952 data for 50 controlled ail shooting stations, when compared with 1943–47 data (when no shooting was undertaken) show o significant difference in number or intensity of hailstorms in this area or other areas of similar pography. New experiments begun in May 1953 with 15 AgI seeding stations may give further formation on success in combatting hail. *Subject Headings:* **1. Hail shooting 2. Hail prevention Switzerland 3. Cloud se eding in Switzerland 4. Magadino Plain, Switzerland.**—*M.R.*

6J–162 551.509.67

Evans, T. H., **The present status of rainmaking.** *Public Works*, N. Y., No. 11:53, 126, Nov. **53.** photo. **DLC**—Statistical analysis of rainfall during the past 2 or 3 years in Colorado and her western states made by the Engineering School of Colorado A. & M. fail to show any significant crease in precipitation which could be attributed to silver iodide seeding of clouds. Nor has there en any proof that the seeding in many cases has not been successful. Since results, if any, are a small scale rather than the large scale at first envisioned, it will take years to come to any sound nclusion in this regard. The cautious attitude of the U. S. Weather Bureau toward enthusiastic aims in the early stages of the cloud seeding "boom" is commended. (*Same item as* 6.1–110, n. 1955, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding evaluation Colorad o.**—*M.R.*

6J–163 551.509.67

Fea, Giorgio et al., **Esperienze di provocazione artificiale della pioggia.** [Experiments in the tificial production of rain.] *Rivista di Meteorologia Aeronautica*, 13(1):3–15, Jan./March **1953.**

12 figs., 10 refs. Italian, French, German and English summaries p. 3. **MH-BH**—A carefully planned attempt at inducing precipitation on the Sila Grande plateau (southern tip of Italy near Monte Scuro) is described and illustrated in detail. Laboratory experiments and climatological studies (monthly roses of winds aloft and total precipitation in region for season, average monthly height of zero isotherm, etc.) were carried out to determine the most effective manner, time and place for seeding and the most favorable synoptic situations. A topographic map and schematic cross section show cloud-silver iodide-zero isotherm and precipitation mechanics. Details of the 6 attempts (Oct. 22 to Nov. 1952?) and results of each are given with comment that they turned out as expected. However, in order to give quantitative statistical evaluation of success, a rain gage network 5 to 10 times as dense (1 to 4 km²) as that used would be desirable. (*Same item as* 6.6–129, June 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding in Italy 2. Cloud seeding with silver iodide 3. Sila Grande Plateau, Italy.**—*M.R.*

6J–164 551.509.67(794

*Hall, W. Ferguson; Henderson, T. J. and Cundiff, Stuart A., **Cloud seeding operations in the Bishop Creek, Calif., watershed.** *U. S. Weather Bureau, Research Paper*, No. 36, Jan. **1953.** 29 p. 31 figs., 7 tables, 7 refs. Also condensed version as: **Cloud seeding in the Sierra near Bishop, California.** *American Meteorological Society, Bulletin*, 34(3):111–116, March **1953.** 9 figs. **DWB**—A critical analysis of results of cloud seeding operations by dry ice carried out by the California Electric Power Co. in the High Sierras near Bishop, Calif. Runoff for the three years (1948–50) from the watershed into Bishop Creek is compared with runoff from nearby watersheds not affected by the seeded clouds, and with runoff for other years (1926-47 and 1917-47). Also the runoff for the 3 years when seeding was conducted is compared with what would be expected from snow survey measurements in the area. Only the 1948 and 1949 runoff was significantly greater in the seeded area, though the average for the 3 years was significant at 5% level; and a 9% increase in flow was indicated for the 3 years with 90% confidence limits between 0 and 18%. The outstanding 1949 values could have been due to 1949 having unusual circulation patterns affecting the immediate area. Less runoff actually occurred than would have been expected from prior snowpack. (*Same item as* 5.1–96, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Bishop, Calif.**—*M.R.*

6J–165 551.509.6

*Howell, Wallace E., Associates Inc., Cambridge, Mass., **Evaluation of cloud seeding in the Androscoggin River Watershed for the Brown Company, Nov.–Dec. 1952.** Feb. 5, **1953.** 28 p. 2 maps (fold.), numerous charts (fold.). **DWB**—The trials which began Nov. 1 and ended Dec. 14, 1952 were made in the catchment areas above Berlin, N. H. Four fixed AgI generator stations were in operation during this period, but two more stations were established west of the area and one on Mt. Washington during mid-Nov., and the one to the east in Maine was discontinued at that time. Two mobile units were also used in the evaluation. Weather situations are described for each case and detailed charts show precipitation which occurred in the area. In each case a comment is made as to the probable effectiveness for particular generators or particular rainstorms. (*Same item as* 6.6-131, June 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding in New Hampshire 2. Androscoggin Watershed, N. H.**—*M.R.*

6J–166 551.509.67:551.577.3(85

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of cloud seeding in the Chicama-Moche region of Peru, for the period Sept. 1951 June 1953.** Dec. **1953.** 30 p. 4 tables, 19 figs., 12 maps. **DWB**—The first report (*see item* 6J–94) gives results of first season's operation from Sept. 1951 to June 1952. The present report gives results from July 1952 to June 1953 and an exhaustive analysis of results of both seasons. The AgI generators were set up on the ground at points near the Continental Divide. Rainfall 30% greater than expected (1 chance in 1000) is claimed for months with 25 hours or more of generator operation, while during months with no seeding a 7% increase (insignificant) occurred. Runoff was 24% more and 10% less than expected in the same respective periods. (*Same item as* 5.11-59, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Peru 2. Chicama-Moche Region, Peru.**—*M.R.*

6J–167 551.509.67:551.577.3(714

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of cloud seeding operation in the Lake St. John Watershed for the Aluminum Company of Canada, Ltd.** March **1953.** 44 p. numerous charts (fold.). **DWB**—See previous report for 1951 (*Item* 6J–118). Cloud seeding trials in Lake St. John, Quebec area from Aug. 9–Oct. 3, 1952 increased precipitation in that area by 15% or an additional 0.94″ of rain in 8 weeks over 7000 sq mi area in target area "A" (northern portion) and 23% or .64″ during 6 weeks from Oct. 29–Dec. 8, 1952 over 20,000 sq mi in area B (southern portion of Watershed). All told 45 billion cu ft of water were squeezed out of the clouds by Howell

that area. About 180 rainfall stations are used on isohyetal charts and in the evaluation. Weather conditions and seeding operations are described and evaluated for each day when seeding occurred. (*Same item as* 5.11–60, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Quebec 2. Isohyetal charts 3. Lake St. John Watershed, Quebec.**—*M.R.*

6J–168 551.509.67:551.577.3(714)

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of the cloud seeding operations in the St. Maurice River Watershed for the Shawinigan Water and Power Company, Nov. 11–Dec. 12, 1952.** April **1953.** 14 p. map, numerous charts (fold.). **DWB**—See previous report for 1951 (6J–118). Silver iodide cloud seeding operations carried out in Quebec (north of St. Lawrence River) during Nov. and Dec. 1952 proved successful, as this report shows. Between Nov. 11 and Dec. 12, 1952 precipitation was increased by 12%, or an 0.46″ increase over 5,100 sq mi, yielding 5 billion cu ft of water, all told. Each situation when seeding occurred is described synoptically and accompanied by charts showing precipitation which occurred within target area, using data for about 180 precipitation stations (list appended). (*Same item as* 5.11 61, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Quebec 2. Isohyetal charts 3. St. Maurice River Watershed, Quebec.**—*M.R.*

6J–169 551.509.67

*§Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation report of 1952 rainfall stimulation program for Central Najasa.** [1953.] 7 p. 4 figs., 2 tables, numerous charts. **DWB**—Study gives daily isohyetal maps for seeding days with hodographs of upper winds, a map of isopercentals of relative anomaly and shows the location of rain gages and generators. A 33% increase of rainfall on the target area as compared with a control area was found. Probability of chance is small. (*Same item as* 5.8–82, Aug. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cuba 2. Central Najasa, Cuba.**—*A.A.*

6J–170 551.509.67

*§Howell, Wallace E., Associates, Inc. Cambridge, Mass., **Evaluation report of 1952 rainfall stimulation program for Macareño Industrial Corporation of New York.** [1953.] 7+p. 2 tables, figs., numerous charts. **DWB**—Study gives daily isohyetal winds with hodographs of upper winds, map of isopercentals of relative precipitation, and shows the location of rain gages and generators. 35% increase of rainfall on the target area as compared with a control area was found. Probability of chance is <1:100. (*Same item as* 5.8–84, Aug. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cuba 2. Macareño, Cuba.**—*A.A.*

6J–171 551.509.67

*§Howell, Wallace E., Associates, Inc. Cambridge, Mass., **Evaluation report of rainfall stimulation program for Central Ermita, May–Dec. 1952.** [1953.] 45 p. 4 figs., tables, numerous charts. **DWB**—Study gives daily isohyetal maps, during summer and winter operations, a map of isopercentals of normal rainfall, and shows the location of rain gages and generators. A 53% increase of rainfall on the target area as compared with a control area was found. This increase is 3.3 times as large as the standard deviation of observed deviations (probability of chance <1=1000). (*Same item as* 5.8–81, Aug. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cuba 2. Central Ermita, Cuba.**—*A.A.*

6J–172 551.509.67:632.187

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Rainfall stimulation in connection with forest fire control, Forestville, Quebec, August 1953.** 1 p. chart. **DWB**—Cloud seeding with AgI was carried out from Aug. 12 to 23, 1953 in the Forestville, Quebec area, in an attempt at controlling a forest fire. Chart shows isohyets of rainfall on Aug. 22–24 in relation to fire area. Success was claimed to the extent that outside the seeding area <.10″ of rain occurred whereas .25 to .92″ fell "within the area of stimulation and near the fire." (*Same item as* 6.6–132, June 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding with silver iodide 2. Forest fire control 3. Forestville, Quebec.**—*M.R.*

6J–173 551.509.67:551.579(747)

*Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Runoff evaluation of cloud seeding in the watersheds of the Stillwater Reservoir and of the Bennett's Bridge (Salmon River) Reservoir conducted during 1951 and 1952.** Nov. **1953.** 8 p. 3 figs., table. **DWB**—Attempts at rainfall stimulation made in the watersheds of the Niagara-Mohawk Power Co. in Sept. and Nov. 1951 proved unsuccessful and attempts made from June–Nov. 1952 yielded 32% more runoff than would be expected if relationship between control and target watersheds were directly proportional. Analysis of rainfall records proved that relation is not directly proportional, so a re-evaluation gave

evidence of runoff increased by 53% over expected amount with reliability of 3 in one thousand. The Cranberry Lake and Hinckley watersheds were used as control areas. (*Same item as* 5.11–62, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in New York 2. Runoff evaluation 3. Northeastern New York (State).**—*M.R.*

6J–174 551.509.67:551.577.1(729.1)

*Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Summary evaluation of cloud seeding operations in Cuba, 1952.** April **1953.** 19 p. 7 figs., 5 maps, refs. **MH-BH**—Effects of cloud seeding operations conducted in five sugar plantations in Cuba are statistically analyzed. Using data from the target and control areas and normals for those areas, regression equations, correlation coefficients, standard errors and probability ratios are computed. Results of the analysis are presented in charts and graphs. The author finds a significant increase of rainfall over the target areas and shows that the probability of such in increase under natural conditions is as small as 1:2,000. (*Same item as* 5.1–91, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in Cuba 2. Precipitation distribution 3. Cuba.**—*G.T.*

6J–175 551.509.67

Joy, Arthur F., **Rainmaker to industry.** *Flying*, Chicago, 53(3):33, 62–64, Sept. **1953. DWB**—Wallace E. Howell is, or has been under contract to perform cloud seeding operations in several countries outside of the U. S. An example of the type of work he is doing in British Columbia, Canada for A/CAN, to provide a sufficient water supply for a huge aluminum refining development, is discussed. Pauls Putnins formerly of Riga, Latvia, is one of his chief meteorologists. *Subject Headings:* **1. Cloud seeding in British Columbia 2. Howell, Wallace E., Associates, Inc.**—*M.R.*

6J–176 551.509.67

KHrgian, A. KH., **Fizika atmosfery.** [Physics of the atmosphere.] Moscow, **1953.** 456 p. 220 figs., 119 tables, refs., eqs. **DLC**—On p. 301–302 is a chapter on **Artificial effects on clouds and on precipitation formation.** In the U.S.S.R. the first experiments in this direction began in 1931–1932 in the Institutes of Experimental Meteorology (in Leningrad and in Moscow) under the guidance of V. N. Obolenskii and S. V. Gorbachev. At present three methods of cloud seeding are known. The first method uses dry ice, i.e., solid carbon dioxide particles; it can produce a small shower from cumulus clouds. The second method uses AgI smoke, which produces snowfall. The third method has been described by E. Bowen: water drops are introduced into clouds at any temperature; falling down they collide with cloud droplets and grow rapidly. The idea of this method was developed by Langmuir. He assumed that a drop growing by coalescence to $r=2.5$ mm splits later into smaller droplets which are carried upward again by the ascending current in the cloud and the coalescence process spreads and develops more and more like a chain reaction. *Subject Headings:* **1. Artificial precipitation 2. U.S.S.R.**—*N.A.S.*

6J–177 551.509.67:016

†Krick, Irving P. (*comp.*), **Bibliography on weather modification and field operations, using the combined facilities of Irving P. Krick, American Institute of Aerological Research (and) Water Resources Development Corporation.** Denver, Colorado, American Institute of Aerological Research, March 25, **1953.** unpaged. Mimeo. Also in: *Meteorological Abstracts and Bibliography*, 4(8):963–968, Aug. **1953. DWB**—A list of 104 lectures or reports prepared during 1947–1953, mostly for agencies contracting with the Water Resources Development Corp., on cloud seeding operations in various parts of the Western U. S. In the subject outline introducing this bibliography, these reports have been referred to by their serial number as found in the original listing. (For Krick's bibliography for 1947–1955, *see item* 6J–346.) *Subject Headings:* **1. Weather modification bibliographies 2. Western United States. I. American Institute of Aerological Research II. Water Resources Development Corporation.**—*G.T.*

6J–178 551.509.67

Krick, Irving P., **Cloud-seeding operations at Dallas.** *American Water Works Association Journal*, 45(11):1144–1150, Nov. **1953.** 6 figs., 2 tables, ref. **DLC**—The cloud seeding operation carried out at Dallas extended from Nov. 22, 1952 to May 22, 1953, and involved the operation of ground generators for approximately 870 hrs. Precipitation patterns associated with specific seeding operations are shown diagrammatically and indicate that in one seeding instance one thunderstorm produced as much rainfall as that normally received during an entire month. Data on percentage change in storage June 1 over Jan. 1, 1953 are given. The total precipitation for the period of seeding expressed as a percentage of normal precipitation for the same period was considerably higher in the target area than in the surrounding territory. (*Same item as* 6.2–87, Feb. 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding in Texas 2. Dallas, Texas.**—*I.L.D.*

6J–179 551.509.67

Krick, Irving P. (*Water Resources Development Corp., Denver*), **Evidence of man-made climatic hange.** *Western Snow Conference, 21st, Boise, Idaho, April 1953*, p. 11–16. [pub. **1953?**] Sachs, Milton S., **Discussion.** *Ibid.*, p. 17–18. charts, ref. **DWB**—Deals with weather modification y cloud seeding. Seeding operations on the water divide of the Colorado, Arkansas and Rio Grande Rivers, extended over three years, resulted in a remarkable increase in snow pack up to 50% in a single year and up to 288% on the average, while neighboring areas received, in some ases, less than ever observed. Maps show the percentage in each year in relation to the normal vater content of the snow. No original data are presented. SACHS points out that an independent valuation committee found even a greater benefit than the operator claimed. (*Same item as* .6–133, June 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding in Colorado 2. Colorado.**—*A.A.*

6J–180 551.509.67:551.577.33

*Langmuir, Irving, **Analysis of the effects of periodic seeding of the atmosphere with silver odide.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project Cirrus, inal Report, Pt. 2, May **1953.** numerous tables, diagrs., foot-refs. Also: **Second revision of hapter 12, and Errata.** (In Langmuir, I., **Widespread control of weather by silver iodide seeding.** General Electric Research Lab., Report No. 55-RL-1263, July **1955.** p. 77–113 and 169–175.) lso: Serra, L., **[Review].** *Puy de Dôme. Observatoire, Bulletin*, No. 3:86–87, July/Sept., **1954.** DWB—This voluminous statistical report begins with the basic discoveries of SCHAEFER and LANGMUIR regarding the effects of dry ice and later of AgI seeding and cloud physics. The seeding of tratus and cumulus clouds, the widespread effects of seeding cumulus clouds and hurricanes; periodic eeding of clouds in New Mexico, methods of evaluating significance of 7-day periodicity in rainfall; eriodicities in cloudiness, wind, pressure, tropopause height, temperature aloft; U. S. Weather ureau studies on 7-day periodicities and, finally, 7-day periodicities and phase propagation over the J. S. occupy subsequent chapters. A great deal of tabular, graphical and statistical data are resented to support controversial claims of high significance. (For Pt. 1, *see* 6J–190.) (*Same tem as* 6F–254, June 1955, *MAB.*) *Subject Headings:* **1. Project Cirrus 2. Cloud seeding with ilver iodide 3. Tropopause height variations 4. Rainfall periodicities 5. Cloud seeding perioicities.**—*M.R.*

6J–181 551.509.67:551.577.1

*Lieberman, Gerald J., **Evaluation of the 1951–1952 cloud seeding experiment in Santa Clara County.** Stanford, Calif., Stanford Univ. **[1953?]** 21 p. tables, refs., eqs. **DWB**—A statistical nethod of rainfall evaluation based on storm totals is developed in detail and applied to records btained in Santa Clara County during the period 1940–1951. It is found that the test failed to roduce sufficient evidence as to the effectiveness of the cloud seeding operations investigated. The esults of the procedure would probably have been significant if rainfall had been increased by 30%. (*Same item as* 5.2–79, Feb. 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding in California 2. Preipitation analysis 3. Santa Clara County, Calif.**—*G.T.*

6J–182 551.509.67:69

Linsley, Ray K., Jr., **Rainmaking—it worries contractors.** *Western Construction*, San Francisco, 8(3):60–62, 140, March **1953.** fig., port., photo. **DLC**—Principles of cloud seeding and the valuation of its results are outlined. It is believed that "functional benefits of cloud seeding (if ny) are in the order of 10% or less of natural rainfall." A determination of economic benefits would require more than a statistical evaluation of the type described by author, since cloud seeding s usually less effective during drought conditions and most effective when natural rainfall is sufficient and added precipitation may even be harmful). Contractors should protect their interests by eing informed of cloud seeding enterprises in their area, establishing records of their losses due to veather, and taking legal action against rainmakers, if warranted. *Subject Headings:* **1. Cloud eeding effects 2. Construction.**—*G.T.*

6J–183 551.509.67(09)

Loewe, Fritz, **Some forerunners of rainmaking by seeding of clouds.** *Weather*, 8(2):35–37, eb. **1953.** 11 refs. **MH-BH**—A brief but informative article on the early history of rainmaking y methods similar to those applied today. GATHMAN took out a patent for cloud seeding with iquid carbonic acid (1891). A. BERG suggested cloud seeding with liquid air (1922) or big water rops (1926). FINDEISEN made cloud seeding flights in 1942–1944 (precipitation formation and loud dissolution was observed). References are given to the original sources reporting these vents. (*Same item as* 4.10–85, Oct. 1953, *MAB.*) *Subject Headings:* **1. Cloud seeding 2. History f cloud seeding.**—*G.T.*

6J–184 551.509.6

New Mexico Institute of Mining and Technology. Research and Development Div., Socorro N. M., **Water resources development. Final Research Report. 1953. DWB**—The followin papers in this report deal directly with cloud seeding operations: Sec. I: Hume, William H, **Induce precipitation.** (44 p. 4 figs., 8 plates, 2 tables, refs.) Starting with an outline on the physics o precipitation, the author describes the research activities of the project. A "cloud census" of Ne Mexico clouds was attempted and the effects of environment on sublimation nuclei, as well as th growth of ice crystals were studied. The practical use of silver iodide generators and balloons wit dry ice is described. Summer and winter seeding operations are summarized. Appendix A (se item 6J–53 above). Appendix E: Workman, E. J., **Some observations bearing on the physica basis for cloud seeding.** Also his **Nature and the question of rainmaking.** Also his: **Possible rol of residual atmospheric ice in middle latitude precipitation.** (26 p. 4 figs.) Three papers presente at meetings. In the first paper the author points out that a synoptic analysis is not sufficient i order to determine the possibility of precipitation and gives an outline of the physical processe involved. A statistical analysis of laboratory experiments shows that the number of nuclei per m increases with decreasing temperature and perhaps has a maximum between −26 and −27°C Radar returns from cloud tops start at −16°C according to 80 samples. The second paper deal with climatic fluctuations (El Paso, 1911–1950), seasonal variability of rainfall, and gives a genera outline of cloud seeding problems. A statistical probability study of precipitation from clouds wit different top heights is presented (400 cases). Almost no precipitation if top is under 22,000 f The third paper emphasizes the nucleation by ice particles. (*Same item as* 5.4–73, April 1954, *MAB*, *Subject Headings:* **1. Cloud seeding in New Mexico 2. Cloud physics 3. Climate of New Mexic 4. New Mexico.**—*A.A.*

6J–185 551.509.6

Quate, Boyd, **Weather modification as applied to hail storms.** *National Association of Mutu Insurance Companies, Fifty-seventh Annual Convention, San Francisco, California, Oct. 11–15, 195 Proceedings and Papers*, p. 192–195. **DWB**—Contains an account of the origin of the Water Resourc Development Corporation of which IRVING P. KRICK is president and a simplified account of clou seeding with AgI, the relationship between ice-crystal formation and precipitation, and the possibl use of AgI cloud seeding to reduce hailstone size and to diminish hail damage. (*Same item a* 6.5–82, May 1955, *MAB*.) *Subject Headings:* **1. Cloud seeding with silver iodide 2. Hail preventio 3. Water Resources Development Corp.**—*I.L.D.*

6J–186 551.509.6

Rain-making efforts are continued in Arizona. *Engineering News Record*, 150(2):35, Jan. 1953. **DLC**—Rain making experiments which have been conducted for two years by the Sa River Valley Water Users Assoc. are reported. Sixteen AgI ground generators are used in thes experiments. Their operation is described. The construction cost of a generator is about $10 Although there are no data available on the effect of the experiments, it is believed that total rainfa has increased. R. J. MCMULLIN, general manager, is quoted as declaring that the Association fee justified in continuing the program. The technique applied was developed by JAKE WEST, chi hydrographer for the Association and his assistant, BORDEN GOODWIN. (*Same item as* 4.9 5 Sept. 1953, *MAB*.) *Subject Headings:* **1. Cloud seeding in Arizona 2. Silver iodide smoke gen erators 3. Arizona.**—*G.T.*

6J–187 551.509.6

Reynolds, Robin R. (*Div. Water Resources, Dept. Public Works, Calif.*), **An evaluation of weathe modification operations in California.** *National Reclamation Association, Washington, D.C., Twenty Second Annual Meeting, Reno, Nevada, Oct. 14–16, 1953, Proceedings*, p. 51–58, **1953. DA**—Review various methods of cloud seeding evaluation and describes the one used by the California Divisio of Water Resources in evaluating cloud seeding experiments in California (1946–1951). The metho adopted is a statistical one, based on comparison of rainfall amounts in target and control area durin the five seeded and five unseeded years. The results are inconclusive for several areas but it found that "within the statistical framework and for the particular years which were used the rainfa increases in Santa Barbara County are significant." The author believes that with this method evaluation a final answer to the problem of an effectiveness of rainmaking may be found on the bas of data from 5–10 years of systematic cloud-seeding operations. *Subject Headings:* **1. Cloud seedin evaluation 2. Cloud seeding in California 3. California.**—*G.T.*

6J–188 551.509.67:551.578.

Ruby, F., **Les nouvelles méthodes de défense contre la grêle.** [New methods of hail pre vention.] *La Météorologie*, Paris, 4th Ser., No. 29:61–72, Jan./March **1953.** French, English an Spanish summaries p. 61. **MH-BH**—The physics of hail formation is first discussed in detail an

hen several methods of hail prevention, including the old method of hail shooting (rockets, etc.) which was said to be 50 to 60% successful, and a new method of including AgI in the explosive harge of the rocket (rather than the inefficient ground generators) so that it would cause the cloud o precipitate prematurely, i.e., before the violent hail eddies had developed. Results obtained by the author and Météorologie Nationale since 1936, which are available in detail, are summarized. Author claims 100% success when AgI rockets are used (both for hail prevention and rain making). (*Same item as* 6.6–138, June 1955, *MAB.*) *Subject Headings:* **1. Hail shooting 2. Artificial precipitation 3. Hail prevention in France 4. Silver iodide rockets 5. France.**—*M.R.*

6J–189 551.509.67:551.578.7

Rui, D. and Romanelli, O., **Quattro anni di sperimentazioni antigrandine in Italia.** [Four years of hail prevention experiments in Italy.] Verona, Grafiche Testi, **1953.** 7 p. **DA**—Brief summary of the history of hail suppression experiments in Italy by means of explosive rockets. The first project was started in 1949. Since that time the area protected was considerably increased and the quality of rockets and arrangement of launching stations improved. Results of the operations are not indicated in this report. *Subject Headings:* **1. Hail prevention in Italy 2. Hail shooting 3. Italy.**—*G.T.*

6J–190 551.574.1

†Schaefer, Vincent J., **Laboratory, field, and flight experiments.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project DA-3-90-07-022, Sc Project 24-172B-0, Project Cirrus, Final Report, Pt. 1, March **1953.** 170 p. 4 tables, figs., 75 refs. **DWB**—Project Cirrus continued from Feb. 28, 1947 to Sept. 30, 1952 under Office of Naval Research and U. S. Army Signal Corps contract. The principal scientists were Irving Langmuir, Vincent J. Schaefer and Bernard Vonnegut. Numerous reports and scientific articles have been issued, but this comprehensive illustrated report summarizes them all and gives details of the history of the research (going back to General Electric studies on gas masks and chemical fogs in 1940–42) and icing studies on Mt. Washington in 1953. The first cold chamber experiment was made in July 1946 and the first cloud seeding on Nov. 13, 1946. Details of laboratory, field and flight experiments are treated in a systematic manner. (For Pt. 2 *see item* 6J–180.) (*Same item as* 6F–275, June 1955, *MAB.*) *Subject Headings:* **1. Project Cirrus 2. Cloud seeding research 3. History of cloud seeding 4. Cloud physics.**—*M.R.*

6J–191 551.574.2:551.578.41

Serpolay, R., **Sur une technique de génération artificielle des cristaux de glace.** [Technique of artificial production of ice crystals.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 3:65–72, July **1953.** 12 figs., 7 refs. **DWB**—An aqueous solution or moistened crystals of AgI prepared from an acetone solution produces ice crystals in supercooled clouds (−3° to 13°C) in the same way AgI smoke does. It is thought that the electrical charges produced by the droplets of AgI solution falling through the cloud provide the mechanism for precipitation formation. This method has been tried in a modified form in Algeria by Ducellier, and can be used in further laboratory investigations of freezing nuclei and crystallization processes. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Ice nuclei formation.**—*M.R.*

6J–192 551.509.67

Siriez, Henri, **L'agriculture et les calamités atmosphériques. I. La lutte contre la grêle.** [Agriculture and weather disasters. I. Hail control.] *Cahiers Français d'Information*, No. 231:4–6, July 1, **1953. II. Aspects législatifs et administratifs de la lutte contre la grêle et la gelée.** [II. The legislative and administrative aspects of hail and frost control.] *Ibid.*, No. 232:11–13, July 15, **1953.** refs. **DA**—In the first part of the paper statements made by Facy and Dessens are reproduced *in extenso*. According to these statements the problem of hail control is still in the experimental stage. This shows that meteorologists do not agree with Ruby in his belief that hail control techniques presently used in France (explosive rockets) are effective and will be further enhanced by the use of silver iodide rockets. The second part of the article criticizes legislation concerning hail control. *Subject Headings:* **1. Hail prevention in France 2. Hail control legislation 3. France.**—*G.T.*

6J–193 551.509.67:551.577

Smith, Theodore B., **On the area-time characteristics of rainfall variability. Detection of precipitation increases.** Pasadena, California, American Institute of Aerological Research, July **1953.** 4 refs. Typescript. **DWB**—In order to properly evaluate cloud seeding effectiveness, it is necessary to have reliable tests of rainfall variability over an area and for a considerable period of time. The optimum time, number of stations in an area and type of station to choose can be determined from statistical studies such as are reported in this manuscript, based on data for 1929 to

1948 for 44 stations in NE New Mexico. The two sections of the study attempt (1) to investigat test conditions under which natural variability can be minimized for a given test and (2) to obtai a measured variability for various tests so that they can be compared with each other. *Subje Headings:* **1. Cloud seeding evaluation 2. Rainfall variations 3. New Mexico.**—*M.R.*

6J–194 551.509.6

†*Terada, Kazuhiko (*Dir. Nagasaki Marine Obs.*) et al., **On the artificial stimulation of rain i the Kyusyu area.** *Oceanography and Meteorology*, Nagasaki, Japan, 6(1):19–88, **1952/53.** graph diagrs., tables, plates, bibliog. p. 38–39. In Japanese; English summary p. 79–88. **MH-BH**—Th first part deals with artificial production of rime, the second gives a detailed report on experimenta stimulation of rain. Dry ice, 1.5 kg each time, was introduced into the atmosphere by balloon an released in a fixed layer. The probable path of the balloon was traced by means of all availabl aerological information. Precipitation measured in the area of the path indicates that the experi ment was rather successful, although it is impossible to determine whether reported meteorologica changes were artificial or natural. (*Same item as* 5.1–100, Jan. 1954, *MAB.*) *Subject Heading* **1. Cloud seeding with dry ice 2. Rime 3. Kyushu, Japan.**—*A.A.*

6J–195 551.509.6

Tixeront, J., **Sur les expériences executées en Tunisie au sujet de la pluie provoquée.** [Ex periments on artificial precipitation carried out in Tunisia.] *Puy-de-Dôme. Observatoire, Bulleti* Ser. 2, No. 1:24–26, Jan. **1953.** ref. **MH-BH**—The results of cloud seeding with $CaCl_2$ carried ou from 1948 to 1950 in Tunis are summarized. The author concludes that seeding produced clou modifications and rain each time but that no explanation can be given for the process. An outlin for experimental seeding procedures for further study is given. *Subject Headings:* **1. Cloud seedin with calcium chloride 2. Tunisia.**—*I.L.D.*

6J–196 551.509.67:3

U. S. Congress. House Committee on Interstate and Foreign Commerce, **Weather modificatio experiments. Hearing before the Committee. . . . 83rd Congress, 1st Session, on H.R. 106 and H.R. 2580, Bills to create a committee to study and evaluate public and private experiments i weather modification;** H.R. 1584, a bill to authorize the Secretary of Commerce to provide fo research and study and in cooperation with the States, to establish appropriate safeguards, wit respect to weather modification operations and the problems related thereto; S.285, an act to creat a committee to study and evaluate public and private experiments in weather modification. Jul 28, 1953. Wash., D. C., Govt. Print. Off., **1953.** 45 p. **DLC**—In addition to text of the 3 bill the document contains reports of Depts. of Agriculture, Health and Welfare, Army and Stat Civil Service Commission, Budget Bureau, National Science Foundation, American Meteorologica Society, etc. on the 3 weather modification committee bills or on the feasibility of weather contr in general. Statements by D. M. Little, Senator Case and others are also included. (*Sam item as* 6.1–112, Jan. 1955, *MAB.*) *Subject Headings:* **1. U. S. Advisory Committee on Weathe Control 2. Weather control legislation.**—*M.R.*

6J–197 551.509.6:3

U. S. Laws, statutes, etc., **An act to create a committee to study and evaluate public and privat experiments in weather modification. Public Law 256, 83rd Congress, 1st Session, S.285.** Ap proved Aug. 13, **1953.** 4 p. **DWB**—This law specifies the aims of the committee, the compositio (both federal and private authorities), the frequency of meetings, employees, hearings which may b conducted, demands for information from government agencies or private operators, periodic report and lastly the final report which shall inform Congress on the "advisability of the Federal Gover ment regulating by means of license or otherwise those who attempt to engage in activities designe to modify or control the weather." *Subject Headings:* **1. U. S. Advisory Committee on Weathe Control 2. Cloud seeding evaluation 3. Weather control legislation.**—*M.R.*

6J–198 551.509.6:3

U. S. to do something about the weather. *New York Times*, Dec. 10, **1953.** p. 1, 95. por **DLC**—Aims of the Weather Evaluation Board which was authorized by Congress, and names of th chairman (Capt. H. T. Orville, U.S.N., ret.) and four members appointed by the Presider are announced. The principal task of the Board is to prepare a report (not later than June 3 1956) containing an evaluation of the various effects of weather modification activities and recon mendations for their effective control. *Subject Headings:* **1. U. S. Advisory Committee on Weathe Control 2. Weather control legislation.**—*G.T.*

6J–199 551.509.6

Vernon, Edward M., **What's wrong with the weather.** *National Association of Mutual Insuran Companies, Fifty-seventh Annual Convention, San Francisco, Oct. 11–15, 1953, Proceedings and Paper*

205–208. 1953. **DWB**—This address is largely a paraphrase of the statement of weather modification, especially cloud seeding, issued by the American Meteorological Society in April 1953. A brief summary of the cloud seeding experiments of E. G. Bowen is given. *Subject Heading:* **1. Cloud seeding.**—*I.L.D.*

6J–200 551.578.71:551.509.67

Weickmann, Helmut, **Entstehung und Bekämpfung des Hagels.** [Formation and prevention of hail.] *Meteorologische Rundschau*, 6(9/10):175–180, Sept./Oct. **1953.** 4 figs., 2 tables, 20 refs. Dessens, H., [**Review**] in: *Puy-de-Dôme. Observatoire, Bulletin*, No. 1:20–23, Jan./March **1955.** Weickmann, H., [**Reply**]. *Ibid.*, No. 2:33–36, April/June **1955. DWB**—From an analysis of the physical structure of a CuNb it is calculated that a hailstone growing from 1–10 mm diameter must pass through 2700 m cloud of water content 7.5 g/m³, taking about 7 min. To grow to 30 mm it must pass through 11,700 m cloud in 19 min or proportionately less for higher water content. A necessary condition is an upward current of at least 9 m/s throughout the cloud. Such extreme conditions cannot be effectively influenced by artificial means (*same item as* 6F–280, June 1955, *MAB*). In his **Reply**, Weickmann re-emphasizes two basic concepts contained in his paper: 1) "to show through the analysis of the microphysical conditions in a thunder- or hailstorm that the Bergeron-Findeisen mechanism cannot be applied blindfoldedly for the explanation of precipitation in thunderstorms"; and 2) "to show how the means which we apply in the fight against hail may just as well backfire and produce a larger hailfall." *Subject Headings:* **1. Hail formation 2. Hail prevention.**—*C.E.P.B., G.T.*

6J–201 551.509.67

Workman, E. J. (*N. M. School of Mines*), **Expert clarifies Southwest rainmaking status and present problems of future.** *The New Mexico Stockman*, 18(11):26, 50, Nov. **1953. DA**—Emphasizes need for more study of the physics and especially the thermodynamics of cloud and precipitation formation and warns of the dangers of certain cloud seeding techniques: "If silver iodide acts like it is supposed to act, and if it is dispensed over a large area in quantities sufficient to be significant for the purposes of rainmaking, it will induce irreversible processes in immature clouds which will decrease the thermodynamic potential of the local system and thereby decrease the probability of the development of a precipitating thunderstorm." *Subject Heading:* **1. Weather control.**—*G.T.*

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6J–202 551.509.67

†Absalom, H. W. L., **Artificial production of precipitation.** *Great Britain. Meteorological Research Committee, M.R.P.* 854, Feb. 27, **1954.** 12 p. 21 refs. Mimeo. **DWB**—The processes involved in natural precipitation are outlined. Rain-making procedures are classified as: dry ice, silver iodide, water drops and hygroscopic material. The need for proper statistical evaluation of results is emphasized. The results of experiments or operations in Africa, America and Australia are described and the conclusion is reached that a definite decision cannot yet be given as to the power of any of the methods to give useful amounts of precipitation. A good bibliography is appended. *Subject Heading:* **1. Cloud seeding.**—*C.E.P.B.*

6J–203 551.509.67

Ahmed, Syed, **Rain making in Pakistan.** *Pakistan Review of Agriculture*, Karachi, No. 1:34–35, **1954. DA**—Report on the cloud physics project in Pakistan directed by E. M. Fournier d'Albe under the sponsorship of the U. N. Technical Assistance Programme. Work has been in progress in the first two phases of research: 1) determination of number of natural condensation nuclei and 2) information on frequency of cloud formations suitable for seeding. It is now entering the third phase (experiments on the effect of cloud seeding). *Subject Headings:* **1. Cloud seeding in Pakistan 2. Cloud seeding research 3. United Nations Technical Assistance Programme 4. Pakistan. 5. Fournier d'Albe, E. M.**—*G.T.*

6J–204 551.509.67:551.5:06

American Meteorological Society, **134th National Meeting, December 28–30, 1954.** *American Meteorological Society, Bulletin*, 35(9):441–448, Nov. **1954. MH-BH**—Contains program of the meeting and abstracts of the papers presented. The principal fields covered were: 1) dynamic meteorology, 2) optics, radiation and instruments, 3) fire weather problems and objective forecasting, 4) microclimatology, 5) Pacific meteorology and 6) weather modification. Abstracts of the following papers on weather modification are included (p. 447–448):

Hutchinson, Howard B., **Water content of the moist layer of California's coastal atmosphere as a potential water resource.**

Todd, Clement J., **Fog dissipation by water spray—is it economically feasible?**

Hoffer, Thomas E.; Hales, J. Vern, and Peck, Eugene L., **An evaluation of the effects of cloud seeding in Southern Utah.**
Todd, Clement J., **Theoretical limits to evaluation or prediction from weather data.**
Lincoln, Russell L., **Sensitivity of techniques applied to Oregon operations.**
Decker, Fred W., **The need for designed and controlled experiments in cloud seeding.**
Day, John A., **Outline of a controlled experiment designed for optimum evaluation.**
(For abstract of last three papers, *see item* 6J 225.) *Subject Headings:* **1. Weather control 2. Meteorological conferences 3. American Meteorological Society.**—*G.T.*

6J–205 **551.509.67**

Apenzeller, F., **L'eau à portée de votre main.** [Water within your reach.] *Agriculture Pratique*, Paris, 118(5):251–253, May **1954. DA**—The cloud seeding technique developed by I. P. Krick and his American Institute of Aerological Research and put into large-scale operation by Water Resources Development Corporation is explained. Spectacular results of the operation are cited. WRDC has offered to undertake rainmaking in France over an area of some 1 million hectares. The author believes that this opportunity to remedy the certainly existing water shortage by a method of proven merit should not be passed up. *Subject Headings:* **1. Cloud seeding in France 2. France.**—*G.T.*

6J–206 **551.509.6**

†Arenberg, Kenneth M.; Bemis, F. Gregg, Jr.; Cushman, Chandler A. et al, **Weather modification: past, present and future.** Weymouth, Mass., Weymouth Gazette Press, **1954.** 49 p. diagrs. photos. refs. biblio. p. 46–48. Obtainable from Weather Modification Group, 270 Beach Street, Wollaston, Mass. "Written in partial fulfillment of the requirements for the course Manufacturing, Graduate School of Business Administration, Harvard Univ." Review in *Weatherwise*, 7(3):74, June **1954. DLC**—The most complete and systematic treatise on weather modification (cloud seeding and rain making) published to date. This monograph covers: 1) history from earliest times, 2) scientific studies and background information on cloud physics, 3) statistical methods of evaluation of results, 4) various government (military, U. S. Weather Bureau and other) activities in weather modification, 5) commercial activities, 6) legal aspects (regulations), 7) potential application and importance. Conclusions are that some success has been obtained and more will be achieved, but economic value has yet to be proved. A chronology of Weather Bureau activities and a good bibliography are appended. *Subject Headings:* **1. Weather control 2. Cloud seeding evaluation 3. Weather modification bibliographies. I. Neisser, Edward II. Thomas, Gerard P. III. Vetterlein, Donald H.**—*M.R.*

6J–207 **551.509.67**

Asada, T. *(Osaka Univ.)*, **Artificial rain-making in Kansai district.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:24–27, **1954.** fig. **DWB**—Cloud-seeding experiments made in summer 1952 in Kansai District by means of ground generators (AgI and Al_2O_3) are reported to have resulted in a statistically significant increase of rainfall in the seeded area. On the basis of this routine seeding operations are now being conducted by the Kansai Electric Power Company, with continuing positive results. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding with aluminum oxide 3. Kansai District, Japan.**—*G.T.*

6J–208 **551.509.6**

Asada, T.; Saito, H.; Sawai, T. and Matsumoto, S., **Some experiments of artificial rain-making.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:81–96, **1954.** figs., 3 refs. **DWB**—Aluminum oxide and silver iodide were found to be equally effective as ice nuclei both in cold-chamber experiments and under natural conditions. Field experiments made with both nucleating agents on Oki Island (Dec. 1952–Feb. 1953) are described in detail. As a result of a statistical analysis rainfall in the seeded area is claimed to have exceeded that in the control area by 20%. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding with aluminum oxide 3. Cloud seeding in Japan 4. Oki Island, Japan.**—*G.T.*

6J–209 **551.509.67:551.578.**

Audisio, Walter, **Per una efficace difesa antigrandine.** [For effective hail control.] *Riforma Agraria*, Rome, 2(9):21–22, Sept. **1954. DA**—Review of the history of hail suppression activities from early hail-shooting practices to the present explosive rocket technique. Legal, organizational and economic aspects of hail rocket projects are discussed. Failure of Swiss hail suppression project (first series of experiments in Magadino Plain) possibly due to small size of rockets used. Author recommends AgI experiments in Italy, similar to those now initiated in Switzerland. *Subject Heading:* **1. Hail prevention in Italy.**—*G.T.*

6J–210 551.509.67

*Augustin, Henri, **Rapport technique sur les opérations de pluie artificielle à Madagascar en 953.** [Technical report on artificial rain operations in Madagascar, 1953.] *Madagascar. Service Météorologique, Publication*, No. 23, **1954.** 38 p. 14 figs., photos, 6 refs. **MH-BH**—During 1953, eding begun near Lake Alaotra in 1952 was greatly augmented and the results published in 3 eparate reports. This report attempts to summarize and evaluate the 1953 trials. Equipment is escribed, which provides NaCl particles from 10 to 75μ in diameter and disperses them into the ee atmosphere (from an airplane). First trials were at Marovoay in April 1953 (7 flights), then t Mantasoa on June 17 and 18 (2 flights) and at Androy on Aug. 20 and Sept. 1 (4 flights), at ianarantsoa on Nov. 21 and 26 (2 flights) and at Nossi-Bé on Aug. 13–18. Results are tabulated, ohyetal charts show rain occurring in area subsequent to seeding and in relation to upper winds, oud photos are presented and conditions and results described in detail. Only a few visible showers ccurred at time, but heavy rains in vicinity in next day or two are attributed to persistence of uclei. *Subject Headings:* **1. Cloud seeding with salt 2. Cloud seeding on Madagascar 3. Mada- ascar.**—*M.R.*

6J–211 551.509.67

Aujeszky, László and Dési, Frigyes, **Természetes és mesterséges eső.** [Natural and artificial ain.] *Hungary. Országos Meteorológiai Intézet, Kis népszerű kiadványai*, No. 5, **1954.** 96 p. 32 gs. **DWB**—Although written in a popular manner, this booklet is a comprehensive review of oud physics and artificial rainfall by authors well versed in the field. After an explanation of atural precipitation processes (synoptic situation, nuclei, dynamic development), the various forms f precipitation and the dynamics of thunderstorms are discussed. The history of weather modifica- on is then outlined (Veraart, Schaefer, etc.) with details on the effects of various seeding agents dry ice, silver iodide, water, hygroscopic substances, calcium chloride, sulphur trioxide, salt solution, c.). Finally, the practical value and the future prospects of artificial precipitation are reviewed. he booklet includes a few details on early artificial precipitation experiments in the Soviet Union— ich as Fedoseev's experiments in Turkmania (reported in 1931) in which rainfall was obtained y electrically charged smoke and by seeding of chemicals from airplanes; Gurdon's experiments in ashkent (clouds were created in a clear sky by means of a gaseous substance, and rain was obtained om such clouds by an electrical method); the use of calcium chloride in the Ukraine (in the 1930's); nd the conference held at the Leningrad Institute of Experimental Meteorology in 1933. The bjective approach of the writers and their lucid presentation of the subject should help to clear the terested layman's mind of much of the confusion still existing in connection with the present status f weather modification. *Subject Headings:* **1. Cloud physics 2. Artificial precipitation 3. History f cloud seeding 4. Cloud seeding in the U.S.S.R. 5. U.S.S.R.**—*G.T.*

6J–212 551.509.67

Bidault, G. and Ousset, J., **Résultats de deux campagnes de pluie provoquée dans le sécteur xpérimental du Maroc Oriental.** [Results of two cloud seeding seasons in the experimental area f eastern Morocco.] *La Terre Marocaine*, Casablanca, 29(296):258–264, July **1954.** 3 tables. **DA**—Results of cloud seeding operations by means of ten AgI ground generators in Eastern Morocco uring the periods Feb.–June 1953 and Oct. 1953–April 1954 are tabulated and discussed. In the 953 season (a dry period) rainfall in seeded eastern Morocco was 98% of normal while in western Morocco it was 40% of normal. In the 1953–54 season (a wet period) the figures were 146% for astern and 115% for western Morocco. A list of seeding operations and rainfall occurrences is lso given. *Subject Headings:* **1. Cloud seeding in French Morocco 2. Cloud seeding with silver odide 3. French Morocco.**—*G.T.*

6J–213 551.509.67

Bidault, G. and Tholy, M. P., **Les techniques d'insémination des nuages susceptibles d'aug- menter le volume des précipitations.** [Cloud seeding techniques apt to increase the amount of recipitation.] *La Terre Marocaine*, Casablanca, 28(293):143–146, April **1954.** 5 photos, 2 refs. **DA**—Practical instructions for conducting cloud seeding operations by means of the most simple echniques, e.g.: 1) AgI generators burning propane, 2) ground generators burning charcoal or coke mpregnated with AgI solution, 3) balloons and 4) rockets. The directions comprise all phases of he operations, including meteorological advice. *Subject Heading:* **1. Cloud seeding techniques.** —*G.T.*

6J–214 551.509.67

Branston, A. J., **Rain on tap.** *Farmer's Weekly*, Bloemfontein, 87:14–15, 17, June 30, **1954.** hotos. **DLC**—An enthusiastic article extolling the merits Dr. Krick's system of weather control. *ubject Heading:* **1. Weather control.**—*G.T.*

6J–215 551.577.33:551.509.67(7

Brier, G. W., **7-day periodicities in May 1952.** *American Meteorological Society, Bulletin* 35(3):118–121, March **1954.** 4 figs., 5 refs. **MH-BH**—The succession of rainy weekends in th Eastern States in April and May 1952, mentioned by HAWKINS (1952), was similar to weekly perio dicities in rainfall in these states and elsewhere in the U. S. in 1950 and 1951 (LANGMUIR). Analys of such data and of 700 mb charts for the Pacific Coast region shows that there was a periodicity i occurrence of troughs or lows (at that level) to the west of Oregon or Washington, leading to th possible conclusion that the seeding activities in the Northwest were subject to a weekly periodicit because of the weekly periodicity in favorable conditions for seeding success and not vice-versa (*Same item as* 6.2–260, Feb. 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding periodicities 2. Rain fall periodicities 3. Cyclone periodicities 4. Pacific Northwest, U. S. I. Hawkins, H. F., J II. Langmuir, Irving.**—*M.R.*

6J–216 551.509.67:551.578.

Brisebois, D. **La lutte contre la grêle.** [The control of hail.] *Agriculture*, Paris, 17(157):2–4 May **1954.** figs. **DA** –Hail suppression efforts were made in the Pyrenees by H. DESSENS o Puy-de-Dôme Observatory during 50 days in 1952 and 70 days in 1953. Preliminary results ar indicated and found to be not entirely discouraging. The location of the AgI ground generator (19 in 1952, 40 in 1953) is shown in charts. Charts showing the development of two hailstorms ar also presented. Operations will be resumed in 1954 with 60 generators. *Subject Headings:* **1. Ha prevention in France 2. Cloud seeding in the Pyrenees 3. France.**—*G.T.*

6J–217 551.509.6

Brouhns, Grégoire, **La pluie provoquée.** [Artificially induced rain.] *Bulletin Agricole d Congo Belge, Belgium. Direction Générale de l'Agriculture*, 45(3):775–780, June **1954.** refs. **DA**– Seven out of nine cloud seeding experiments made in Mayumbe, Belgian Congo, in March 1954 ar reported to have produced positive results. The method used was the burning of impregnate charcoal (AgI) in mobile generators. The experiments will be continued for another season; i this is equally successful, a permanent cloud seeding operation will be set up. The effect of th seeding experiments was observed both visually and by comparison of rainfall amounts. *Subje Headings:* **1. Cloud seeding in Belgian Congo 2. Belgian Congo.**—*G.T.*

6J–218 551.509.67:634.

Brown A. A. (*U. S. Forest Service, Wash., D. C.*), **The significance of weather modification to forester.** *Journal of Forestry*, 52(12):899–901, Dec. **1954. DLC**—The importance of weathe modification from the point of view of forest fire control and of forest growth is discussed along wit the controversial problem of the effectiveness of cloud seeding. Includes **Statement on Weathe Modification** published in the *American Meteorological Society, Bulletin*, May **1953,** p. 218. *Subje Headings:* **1. Weather control 2. Forestry.**—*G.T.*

6J–219 551.574.1 551.509.6

C—, —, **Die Wolkenuniversität von Arizona.** [The Cloud University in Arizona.] *Orion* Munich, 9(21/22):854, Nov. **1954. DA**—In conjunction with the establishment of the Cloud Uni versity at Tucson (a joint project of the Universities of Chicago and Arizona and the U. S. Advisor Committee on Weather Control), this note reflects on the world-wide interest rainmaking is nov receiving. Twenty-six nations have taken an active part in weather-modification activities so far In the U. S., sponsorship of cloud seeding operations is shifting from farmers to water works and th water power industry. *Subject Heading:* **1. Cloud seeding research.**—*G.T.*

6J–220 551.509.67:551.594.2

Can we stop lightning? *The Timberman*, Portland, Oregon, 55(5):58–60, March **1954.** photo **DLC**—A description of thunderstorm dispersal tests carried out for California Division of Forestry by flyer KENNETH PERRY and reported by FRED HERBERT, chief assistant to the deputy state foreste in charge of fire control. The technique used involves flight into thunderclouds and release o "chemicals which cause the clouds to change to stratus type." The test flights were undertake when storms were fully developed, with cloud bases at 10,000 to 12,000 and tops at 35,000 to 45,00 ft. In the treated area thunderstorm cells disintegrated within 15 min to one hr and 50 min, whil lightning activity continued in surrounding areas. The areas treated were 30 mi wide and 60 to 10 mi long. Calculations based on estimated number of fires prevented make the operation appea economically sound. *Subject Headings:* **1. Cloud seeding from airplane 2. Thunderstorm dispersal** —*G.T.*

6J–221 551.509.6

Chiaraluce, Oscar, **Pioggia artificiale sulla Sila.** [Artifical rain in Sila.] *Stagioni*, Rome 3(5):7, Jan. 31, **1954. DA**—Cloud seeding experiments by means of AgI ground generators wer

nade in Oct. and Nov. 1953 by a team of the Italian Meteorological Service and Geophysical In-titute on Scuro Mountain, Calabria, Italy. Diagrams show the orographic upslope currents carry-ng AgI smoke into the clouds, and reactions of clouds in various stages of development. Several nstances of successful seeding are reported. *Subject Headings:* **1. Cloud seeding in Italy 2. Scuro Mountain, Italy.**—*G.T.*

6J–222 551.509.67(08)(52)

Committee for Rain-making in Japan, Tokyo, **Report of rain-making in Japan,** vol. 1, **1954.** 159 p. 2 reprints. photos., diagrs., tables, refs. All in English. **DWB**—A nice collection of nearly a score of reports and scientific papers read at a symposium held in Tokyo in the autumn of 1953. The Committee on Rain-making in Japan was organized in the spring of 1952 by academic and government meteorologists and technicians of the electric power companies to see if some way could not be found to relieve situations such as occurred in 1951 when rainfall was so scarce all over Japan that needs for power could not be met. Rain-making experiments were begun in 1951. Since 1952 meetings of the Committee have been held twice a year to discuss results of experiments and plan future work. Papers on cloud seeding and cloud physics are listed in *Meteorological Abstracts and Bibliography*, 6(6):886, June **1955.** The papers on cloud seeding are analyzed separately in the present bibliography. (*Items* 6J–207, –208, –241, –242, –254, –255, –270, –275, –277 to –279 and –290.) (*Same item as* 6F–365, June 1955, *MAB.*) *Subject Headings:* **1. Artificial precipitation symposia 2. Cloud seeding in Japan 3. Cloud physics 4. Japan.**—*M.R.*

6J–223 551.509.67

Compañía Mexicana de Luz y Fuerza Motriz, S. A., **Informe sobre la lluvia artificial. Año de 1954.** [Artificial rainfall report for the year 1954.] 7 p. 9 figs. Typewritten English translation attached. **DWB**—Cloud seeding operations were conducted in the Necaxa region, Mexico, for five summer seasons (1949–1951, 1953 and 1954). Results of the total operations are summed up and those for 1954 analyzed in detail by means of a regression analysis involving control areas. Results of the year are found to be positive for rainfall of less than 50 mm. For the five seasons normal trade wind precipitation shows positive anomaly in the seeded area; data on cyclonic rain and small rains are inconclusive. *Subject Headings:* **1. Cloud seeding in Mexico 2. Mecaxa, Mexico.**—*G.T.*

6J–224 551.509.67

Cramer, Owen P. (*Portland, Ore.*), **A critical look at cloud seeding.** *Journal of Forestry*, Wash., D. C., 52(7):515–517, July **1954.** 15 refs. **DLC**—Four methods of cloud seeding evaluation are reviewed, namely: 1) Observed vs. normal precipitation (no control area), 2) target area vs. control area, 3) seeded storm vs. unseeded storm of similar type and 4) the modified regression method worked out by the Statistical Laboratory of the University of California. Preference is given to the last mentioned method which is more refined than the others; it involves use of long records and of control areas, and rainfall classification by synoptic type. *Subject Heading:* **1. Cloud seeding evaluation.**—*G.T.*

6J–225 551.509.67

The current status of evaluation of commercial cloud seeding operations. [Papers presented at the American Meteorological Society's 134th National Meeting, Dec. 28–30, **1954.**] Contains: Lincoln, R. L., **Sensitivity of techniques applied to Tri-Counties, Oregon, Operations.** Decker, Fred W., **The need for designed and controlled experiments in cloud seeding.** Day, John A., **The outline of a controlled experiment designed for optimum evaluation.** Discussion. Photostat of typescript. unpaged. Abstracts in *American Meteorological Society, Bulletin*, 35(9):447–448, Nov. **1954. DWB**—The first paper describes an evaluation technique sensitive enough to establish the significance of a 16% increase over expected rainfall (the actual increase in the data analyzed was only one third of this). The second paper discusses a system of regression equations utilizing all weather factors related to the factor being modified. The third paper suggests requirements for cloud seeding experiments which should provide adequate data for evaluation purposes. *Subject Heading:* **1. Cloud seeding evaluation.**—*G.T.*

6J–226 551.509.67

Davies, D. A., **Experiments on artificial stimulation of rain in East Africa.** *Nature*, London, 174(4423):256–258, Aug. 7, **1954.** 7 refs. **DWB**—In continuation of earlier experiments, finely ground salt carried by balloons was successfully exploded in cu cloud on 64 occasions. Of these, no rain fell on 17 (cloud often dispersed), very light rain fell but did not reach ground on 10, light rain on 30, moderate on 3 and heavy on 4. The lag between inoculation and rain was 7–35 min, average about 24 min in good agreement with 22 min expected on Bowen's theory. (*Same item as*

5.11–58, 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding with salt 2. Balloon bomb technique 3. East Africa.**—*C.E.P.B.*

6J–227 551.577.59:551.590.25

Davis, Saville R., **Revolution in rain?** *Christian Science Monitor*, 46(60):9, Feb. 5, **1954.** graphs. **DLC**—E. G. BOWEN's discovery of peak rainfall values on certain calendar days and his resulting meteor dust theory are discussed. Included are graphs representing long period average records of Jan. rainfall for Sydney, Auckland, Durban, Santiago, British Isles and U.S.A., all showing marked maxima around the same dates. Implications concerning artificial precipitation are touched upon. *Subject Headings:* **1. Meteoric dust effect on rainfall 2. Rainfall singularities.**—*G.T.*

6J–228 551.509.67

Dessens, H., **A propos d'essais de pluie provoquée dans les régions equatoriales ou tropicales.** [On experiments on artificial precipitation in equatorial and tropical regions.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 2:56–60, April/June **1954.** 9 refs. **DWB**—Some unpublished results of experiments on cloud seeding with sodium chloride, and with silver iodide, the efficacy of silver iodide seeding as indicated by various experiments are discussed and their inconclusiveness is pointed out. Evidence of possible successful seeding with dry ice in equatorial regions is cited. B. VONNEGUT's method of silver iodide seeding is recommended for successful cloud seeding results. *Subject Headings:* **1. Cloud seeding in tropics 2. Cloud seeding techniques.**—*I.L.D.*

6J–229 551.574.1:06

Dessens, H., **Comptes rendus de deux Congrès Internationaux.** [Reports on two International Conferences.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 3:77–85, July/Sept. **1954. DWB**—The papers concerning cloud physics and practical meteorology read at the I.U.G.G. Conference in Rome, Sept. 14–25, 1954, and at the International Colloquium on Experimental Meteorology at Zurich, Oct. 4–6, 1954 are reviewed—some of the latter in great detail. *Subject Headings:* **1. Cloud seeding research 2. Weather control 3. Conferences.**—*M.R.*

6J–230 551.509.67

Dessens, H. and Soulage, G., **Nouveaux essais de précipitation des nuages surfondus, hiver 1953–1954.** [New experiments on precipitation from supercooled clouds, winter 1953/54.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 2:43–52, April/June **1954.** 5 figs., 6 refs. **DWB**—During the winter of 1953–1954, when dense and stable stratus clouds were over the Puy-de-Dôme Observatory, wood charcoal impregnated with AgI was burned from 1600 to 2600 hours. Small crystals were precipitated. These crystals were hexagonal plates. Similar results were obtained on other occasions with stratocumulus clouds. Such clear cut results were not obtained with the use of dry-ice. Possible explanation of nucleation with AgI and observations on natural precipitations from a supercooled stratus are discussed. (*Same item as* 6.3–85, March 1955, *MAB.*) *Subject Heading:* **1. Cloud seeding with silver iodide.**—*I.L.D.*

6J–231 551.509.67

*Douglas, R. H., **Statistical analysis of the results of cloud seeding in Quebec, 1951 and 1952.** *Canada. Meteorological Div., Cir-2536* Tec-193, Sept. 13, **1954.** 21 p. 18 figs., 4 tables, 11 refs. **DWB**—Cloud seeding with AgI was carried out during the fall and early winter months of 1951 and 1952 over the St. Maurice and Lake St. John-Saquenay watersheds in the province of Quebec. The resulting precipitation data are analyzed statistically by the "target-on-control regression" technique and the k-rates technique. Deficits in rainfall were found over the St. John watershed during 5 out of the 6 seeded months. Owing to evidence of abnormality in the rainfall patterns it is doubtful that these deficits were caused by seeding. The increase in precipitation during Dec. 1952 cannot be attributed to seeding. No significant effect appears to have been produced over the St. Maurice watershed. *Subject Headings:* **1. Cloud seeding in Quebec 2. Quebec Province, Canada.**—*I.L.D.*

6J–232 551.509.67

*Eber, L. E., Mordy, W. A. and Johnson, D. S., **Experiments in seeding clouds with hygroscopic materials.** (In Mordy, W. A. et al., **Cloud seeding project, Summary report, 1952–1953.** Honolulu, [1954?] p. 4.1–4.29. 17 figs., 3 tables, refs.) **DWB**—Seeding trials undertaken in Hawaii in 1952 and 1953 are described in detail. In these experiments non-freezing clouds were sprayed with sea water or salt solution; the results were observed by radar. Data obtained are presented in tables and charts; radarscope photographs are included. Precipitation echoes were obtained in nine out of thirty trials. The results lead to the conclusion that "some rain can be produced from warm clouds in Hawaii by seeding with droplets of water or salt solution. The percentage of successful cases is less than reported by BOWEN for similar experiments conducted in Australia." It is

ggested that this might be due to the smaller size of the clouds seeded in Hawaii. (*Same item as* -107, Sept. 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding with water 2. Cloud seeding in awaii 3. Radar analysis of rain 4. Rain from nonfreezing clouds 5. Hawaii.**—*G.T.*

6J–233 551.509.67

Elliott, Robert D. and Strickler, Robert F. (*N. American Weather Consultants, Santa Barbara irport*), **Analysis of results of a group of cloud seeding projects in Pacific slope watershed areas.** *merican Meteorological Society, Bulletin*, 35(4):171–179, April **1954.** 6 figs., 2 tables, 11 refs. **IH-BH**—Statistical analysis of results of cloud seeding in 3 target areas of the Far West (Central erras, Southern Cascades and Bitterroots of Calif., Oregon and Idaho, respectively) during 1951, 952 and 1953, compared with simultaneous precipitation in control areas located near (but not djacent to) the target areas and to the N and S along the same ranges, shows that excesses of recipitation (or snowpack) in the target areas averaged about 20% which is significant but not mpressive, and varied from −11% to +107% during individual seasons. Poorest results are ttributed to possible overseeding or seeding of control area by other projects or by chance drift of gI from the generators over the control area. (*Same item as* 6.3–86, March 1955, *MAB.*) *Subject eadings:* **1. Cloud seeding in Western U. S. 2. Cascade Mountains, Oregon 3. Sierra Nevada Iountains, Calif. 4. Bitterroots Mountains, Idaho.**—*M.R.*

6J–234 551.578.7:551.509.67

Estienne, P., **La grêle et la lutte contre la grêle.** [Hail and hail control.] *Revue de Géographie lpine*, Grenoble, 42(1):185–189, **1954. DLC**—The development of scientifically sound seeding echniques (ground-based AgI generators) has made it unjustifiable to continue with obviously orthless hail-shooting methods. But even modern cloud-seeding techniques are by no means in-allible. They depend on accurate forecasting which is not easily obtained. Premature precipitation f thunderclouds may rob certain regions of vital precipitation. Author recommends legislation ntroducing compulsory hail insurance; this would leave more liberty of action to research scientists. *ubject Headings:* **1. Hail prevention 2. Cloud seeding with silver iodide.**—*G.T.*

6J–235 551.509.67

Friggens, Paul, **What's happened to rain-making?** *Farm Journal*, p. 14, 93, July **1954.** diagr. **DLC**—A brief survey of current commercial rain-making operations in the United States, showing decline in contracts with farmers, but increase in overall business owing to the interest of public tilities and cities. *Subject Heading:* **1. Cloud seeding in U.S.A.**—*G.T.*

6J–236 551.509.67:551.507.321.2

Henderson, T. J. (*Calif. Elec. Power Co., Bishop*), **Cloud seeder gives balloons a try.** *Electrical Vest*, San Francisco, 112(3):66–67, March **1954.** illus. **DLC**—The use of neoprene meteorological alloons to carry dry ice pellets to elevations of about 8500 ft by the California Electric Power Co. described. *Subject Headings:* **1. Cloud seeding techniques 2. Neoprene balloons.**—*I.L.D.*

6J–237 551.509.6:34

Hollister, Paul, Jr., **Who owns the weather?** *The Freeman*, N. Y., Feb. 8, **1954.** p. 345–347. bstracted from separated sheets. **DWB**—The past and present activities and their consequences n regard to "rain making" are reviewed from Espy (1841) to Krick and Howell in recent years. Congressional action to decide whether rain making is feasible and what kind of legislation is neces-ary (Federal, State and local) is reviewed. The Advisory Committee on Weather Control is xpected to settle the question by June 1956. *Subject Headings:* **1. U. S. Advisory Committee on Weather Control 2. Artificial precipitation 3. Weather control legislation.**—*M.R.*

6J–238 551.509.67

Howell, Wallace E., **Rainfall stimulation for hydro-electric power.** *Water Power*, London, (1):16–21, Jan. **1954.** 9 figs. Also his: **Ours or theirs?** *Ibid.*, 6(8), Aug. **1954.** 8 p. 10 figs., tables. Abstracted from reprints. **DWB**—In the first article the history of cloud seeding, benefits f increased precipitation in various economic fields and geographic locations, and requirements of a ommercial weather modification program are discussed. Attractive photographs are included. n the second paper the problem of evaluation is taken up. Evaluation methods based on single torms are reviewed. A regression method involving control areas is explained in detail and illus-rated by the example of seeding operations in Cuba in 1953. Operations evaluated by runoff ata are also discussed. The average increase of rainfall in a number of projects at various times nd places is found to be 26%. "Comparison of this average with the mean of the percentage igures (35%) shows, that, on the whole the larger percentage increases must have been associated vith the smaller rainfalls." *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding evaluation . Cuba.**—*G.T.*

6J–239 551.509.6

†Howell, Wallace E., Associates, Inc., **Rainmaking with spray.** Cambridge, Mass. [1954] 11+p. 25 figs., 6 maps, refs. **DWB**—Results of rain stimulation trials made in non-freezing cloud (Cuba, Feb.–March 1954) are reported. Theoretical basis, equipment, operations and results o each individual flight, are summed up and illustrated with cloud photographs and rainfall maps A "short bibliography relating to rainfall stimulation from non-freezing clouds" (23 refs.) is appended The evaluation of the experiments is based on rainfall measurements on operation days in the seede area and in surrounding areas. It is estimated that "a well-conducted operational program ca approximately double the rainfall of a typical winter month and treble or quadruple the number o days in such a month when significant amounts of rain fall." In exceptionally dry years longe periods may occur when conditions do not favor seeding operations. *Subject Headings:* **1. Clou seeding in Cuba 2. Cloud seeding with water 3. Rain from nonfreezing clouds 4. Cuba.**—*G.T*

6J–240 551.509.67:551.501.

Johnson, David S., **Application of radar to cloud physics research in Hawaii.** (In Mordy, W. A et al., **Cloud seeding project, Summary report, 1952–1953.** Honolulu, [1954?] p. 2.1–2.13 8 figs., 15 refs.) **DWB**—Clouds and rain in Hawaii have been investigated by means of two mobil radar units supplemented with time-lapse cameras. Findings related to natural and artificia rainfall from warm clouds are summed up. In the rainfall stimulation experiments clouds wer seeded from an airplane with sea water, saturated salt solutions or crystalline NaCl. A typica experiment (Feb. 21, 1953) is described, in which a cloud extending from 3000 to 7000 ft and "con sidered to be barely favorable for rain" was seeded with sea water. A precipitation echo was obtaine $11\frac{1}{2}$ min, and a shower occurred $20\frac{1}{2}$ min, after spraying began. *Subject Headings:* **1. Cloud seedin with water 2. Radar analysis of rain 3. Rain from nonfreezing clouds 4. Hawaii.**—*G.T.*

6J–241 551.509.6

*§Kitamura, Kazuo, et al. (*Osaka District Central Met. Observ.*), **On the experiment of rain-makin conducted at Saigo (Oki Islands) during the winter of 1952–1953.** *Committee for Rain-making i Japan, Tokyo, Report of Rain-making in Japan,* 1:97–114, **1954.** numerous figs., 5 tables. **DWB**— This report is concerned with the effect of artificial nuclei (AgI or Al_2O_3). The authors apply th "variance analysis method" to precipitation in the seeded and unseeded areas having the sam isohyet for a normal winter. The results are as follows: a) precipitation is increased by 3.05 mm a day in the zone where normal winter precipitation amounts to 800 mm or more, b) 2.85 mm in th 800 to 600 mm zone, c) 2.59 mm in the 600 to 400 mm zone, d) 0.72 mm in the 400 to 200 mm zone e) the amount of increase is 2.51 mm on the average. *Subject Headings:* **1. Cloud seeding in Japa 2. Saigo, Oki Islands, Japan.**—*G.T.*

6J–242 551.509.6

Kobayashi, T. and Okita, T., **General survey of studies on artificial precipitation in Hokkaid District.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan,* 1:3–7 **1954.** table, 8 refs. **DWB**—In Hokkaido district, the studies on the artificial precipitation hav been carried out since Feb. 1953 by the members of the Institute of Low Temperature Science o Hokkaido University, the Asahikawa Branch of Hokkaido Gakugei University, the Sapporo Distric Meteorological Observatory and Asahikawa Weather Station in cooperation with the Hokkaid Electric Power Company. The principal features of the studies consisted in the following two kind of experiments: 1) Several basic experiments on artificial precipitation were performed by seedin the natural supercooled steam fog in winter, with a view to clearing up the problems concerning th seeding technique for silver iodide and dry ice, the efficiency of silver iodide nuclei, and the growt of ice crystals under variant atmospheric conditions. 2) Applying the results of the late S. OGIWARA' study on "the growth of water droplets around hygroscopic particles in convective cloud" we seede the cumulus cloud with droplets of saturated sodium chloride solution by making use of ground based generators in August 1953 in the mountainous district at Daisetsu. *Subject Headings:* **1. Clou seeding in Japan 2. Hokkaido District, Japan.**—*Authors' abstract.*

6J–243 551.509.6

Krick, Irving P., **Progress in weather control.** *American Waterworks Association, Journa* 46(8):803–817, Aug. **1954.** 3 tables, 4 figs., 4 refs. **DLC**—History of cloud seeding is reviewed and data presented to show the results of seeding in the Yellowstone Basin, in Spain and Portugal and in other places in the U.S.A. and in Mexico or Central America. The author states that clou seeding will not produce rain, but merely increases the amount by speeding up activity in the clouds It also does not deprive other areas of rain since only a small portion of the possible moisture i squeezed out of the atmosphere in passing over the place in question, and an additional amoun (say 2%) which would appreciably increase the economic advantages would subtract an inappreciabl

amount from that available elsewhere. Legal aspects and future developments are also discussed. *Subject Headings:* **1. Weather control 2. Cloud seeding with silver iodide.**—*M.R.*

6J–244 551.509.67

Krick, Irving P. and Fleming, Roscoe, **Sun, sea and sky: weather in our world and in our lives.** Philadelphia, Lippincott, **1954.** 248 p. diagrs., photos. **DLC**—In the last three chapters of the book (p. 185–243) the history and physics of cloud seeding, its value to various interests and its importance in world economy are discussed. The author underlines the merits of practical application (as opposed to pure scientific research) in advancing the cause of science in general and that of rainmaking in particular. (For fuller abstract *see item* 6.7–6, July 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding 2. Popular meteorology.**—*G.T.*

6J–245 551.509.67:551.574.1:551.579

Krick, Irving P., **Technical and economic aspects of weather modification in relation to water supply.** *Institution of Water Engineers, Journal,* 8(4):336–352, July **1954.** 5 figs., 2 tables. **DWB**—Cloud seeding may increase rainfall from a storm cloud by 50%. It does not interfere with the hydrologic balance, but speeds up the cycle. Statistical proof can only be obtained by prolonged operation. Physics of cloud seeding are described. Temperatures at which various nuclei become operative are set out; AgI is the most practicable. Method of operation is described. Results on winter snowfall in Colorado Rockies and annual rainfall in Rio Alberche region in Spain are favorably assessed. (*Same item as* 6.2–88, Feb. 1955, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding in Spain 3. Rio Alberche Region, Spain.**—*C.E.P.B.*

6J–246 551.509.67

Krick, Irving, **Topics in address by Dr. I. Krick at Brandon, Manitoba, Canada, March 26, 1954.** *Canada. Meteorological Div., Circular* 2479, Pub. 175, May 5, **1954.** 5 p. **DWB**—Comments by KRICK are extracted from his speech to farmers in S.W. Manitoba in which he: 1) denied ability to "produce rain" but merely to increase rainfall when it already occurs in an area; 2) explains ability to prevent hail; and 3) denies possibility of "overseeding" clouds. He also claims responsibility for present-day methods of long range forecasting. Results of previous years of AgI seeding in the Brandon area are summarized and comments by ANDREW THOMSON appended. (*Same item as* 6.5–80, May 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding with silver iodide 2. Brandon, Manitoba. I. Thomson, Andrew.**—*M.R.*

6J–247 551.509.67

Linsley, Ray K., Jr., **Artificial precipitation control.** *American Society of Civil Engineers, Proceedings,* v. 80, Separate No. 547, Nov. **1954.** 19 p. 3 figs., 2 tables, refs. **DLC**—This review of cloud physics and cloud seeding leads to the following conclusions: (1) A certain amount of rain may be induced artificially from supercooled clouds; (2) AgI is theoretically an effective nucleating agent but it is less effective than dry ice, according to experimental tests; (3) Conditions favorable to cloud seeding are the same as those required for natural rainfall; (4) Statistical studies by independent agencies have failed to show significant results of ground-based AgI seeding; (5) Hydrologic studies in target area are required for the economic evaluation of cloud seeding operations; (6) Seeding offers no relief from serious and prolonged drought; (7) State or Federal regulation of rainmaking operations is desirable and (8) Agencies should take proper precautions before employing the services of seeding companies. *Subject Heading:* **1. Weather control.**—*G.T.*

6J–248 551.509.67

Ludlam, Frank Henry and Scorer, Robert S., **Further outlook.** London, Allan Wingate, **1954.** 174 p. 25 figs., 12 plates. **DWB, DLC**—Under the headings Weather Control (p. 120–149), Testing Rainmakers (p. 159–161) and Modern Sorcery (p. 161–163), the problems of weather modification in general and cloud seeding in particular are discussed. Modification of microclimates, air pollution control, fog dispersal, frost protection, the history of cloud modification, the various cloud seeding techniques, possible large-scale effects of seeding (LANGMUIR), problems of evaluation, etc. are taken up. Present rainmaking techniques are a product of our natural philosophy just as ancient magic was based on the philosophy of earlier times. Those obsolete methods now seem ludicrous to us and so will our methods "to a generation possessed of a far more advanced natural philosophy." *Subject Heading:* **1. Weather control.**—*G.T.*

6J–249 551.509.67:551.578.7

Messori, A., **A che punto siamo nella difesa contro la grandine?** [Where are we in hail control?] *Il Coltivatore e Giornale Vinicolo Italiano,* Casale Monferrato, 100(4):155–156, April **1954. DA**—Brief summary of the history of hail suppression efforts. Hail shooting which was practiced with eager hopes at the beginning of this century proved inadequate. The use of explosive rockets was

found to be effective in Italy but was abandoned as ineffective in Switzerland. The use of A smoke, recently begun in Switzerland, may be the answer to the problem. *Subject Heading:* **1. H prevention.**—*G.T.*

6J–250 551.509.

Montauti, J., **El clima artificial.** [Artificial climate.] *Revista Meteorológica*, Montevide 13(46):19–25, June 1954. **MH-BH**—In connection with possibilities of weather modification, su as fog dispersal, inducement of precipitation, and hail suppression, the author discusses gene knowledge on properties of clouds and on precipitation formation. He mentions evidence of su cessful cloud seeding with dry ice in the U. S. (1947) and Australia. *Subject Headings:* **1. Clo physics 2. Cloud seeding 3. Weather control.**—*G.T.*

6J–251 551.509.

Mordy, Wendell A.; Johnson, David S. and Eber, L. E., **Cloud seeding project, Summa report, 1952–1953.** Honolulu, Territorial Cattlemen's Council [and] Pineapple Research Institu and Experiment Station [both of] Hawaii Sugar Planters' Association. [1954?] each secti repaged. figs., refs. **DWB**—Seven papers dealing with rainfall and artificial precipitation stud in Hawaii are included in this report. These papers are the result of investigations related to t following problems: a) What are the physical properties and processes of clouds and rainfall Hawaii? b) Can rain be induced to fall artificially? c) How can we verify that rainfall after seedi is produced by the seeding? (A radar evaluation technique has been developed) d) How ofte where and how much rain can be induced artificially? e) Can this be done economically? T papers presented are:

Mordy, W. A. and Eber, L. E., **Observations of rainfall from warm clouds.** 18 p.

Johnson, David S., **Application of radar to cloud physics research in Hawaii.** 13 p. (*See it* 6J–240.)

Woodcock, A. H. and Mordy, W. A., **Salt nuclei, wind and daily rainfall in Hawaii.** 21 (*See item* 6I–127, Sept. 1955, *MAB.*)

Eber, L. E. et al., **Experiments in seeding clouds with hygroscopic materials.** 29 p. (*item* 6J–232.)

Mordy, W. A. and Eber, L. E., **Tentative practical estimates of rain potential from aircr seeding.** 11 p. (*See item* 6J–252.)

Eber, L. E., **Some aspects of seeding clouds from the ground.** 11 p. (*See item* 6I–108, Se 1955, *MAB.*)

Subject Headings: **1. Cloud seeding in Hawaii 2. Cloud seeding with water 3. Cloud seedi evaluation 4. Saline nuclei 5. Radar analysis of rain 6. Rain from nonfreezing clouds 7. Haw I. Territorial Cattlemen's Council (of Hawaii) II. Pineapple Research Institute of Hawaii III. H waiian Sugar Planters' Association. Experiment Station.**—*G.T.*

6J–252 551.509.

Mordy, Wendell A. and Eber, L. E., **Tentative practical estimates of rain potential from a craft seeding.** (In Mordy, W. A. et al., **Cloud seeding project, Summary Report, 1952–19** Honolulu, [1954?], p. 5.1–5.11. 2 figs.) **DWB**—The total amount of rainfall that could be tained by systematic seeding from aircraft over Hawaii and the cost of such operations are estimat According to the estimate the theoretical maximum obtainable by perfect seeding operations, if cloud would be missed and none of the droplets would evaporate on their way down, would be 48 a year from typical trade-wind cumulus clouds (occurring on 200 days a yr), 50 in. from thick cum (50 to 100 days a yr) and 63 in. from very thick clouds (25 to 50 days a yr). The cost would (again under ideal conditions) $50,000/yr for 16 in. of rainfall over an area of 100 sq mi. *Subj Headings:* **1. Cloud seeding in Hawaii 2. Cloud seeding with water 3. Rain from nonfreezi clouds 4. Hawaiian Islands.**—*G.T.*

6J–253 551.509.67:551.57

Müller, G. H., **Kann man Hagelschlag wirksam bekämpfen?** [Can hailfall be control effectively?] *Germany. Deutscher Wetterdienst, Wetterkarte*, Nos. 4, 5, 6, Jan. 4, 5, 6, **1954.** [p. of each issue. **DWB**—Old-fashioned hailshooting and modern hail rocket techniques are equa ineffective because the mechanical energies available with such means are utterly inadequate compared with those involved in hailstorms. This statement is supported by the negative resu of 5 years of hail rocket experimentation in the Magadino Plain, Switzerland (1948–1952). Clo seeding techniques might have a better chance to succeed. The author believes that funds should made available for research on physical processes of the atmosphere instead of being used for waste experiments. *Subject Headings:* **1. Hail prevention 2. Weather control.**—*G.T.*

6J–254 551.509.67:551.574.2

Naitô, Hideo and Sugawara, Ken (*Nagoya Univ.*), **Determination of chemical composition of silver iodide smoke for rain-making.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:77–81, **1954.** 4 tables, ref., 2 eqs. **DWB**—The chemical composition of silver iodide smoke emitted by a cloud-seeding generator was tested by two different techniques (Cottrell precipitator and thermal precipitation). Despite discrepancies between results obtained by the two methods the author concludes that "more than one half and frequently more than 90% of the silver iodide is emitted into the air without decomposition." *Subject Headings:* **1. Silver iodide smoke generators 2. Silver iodide nuclei.**—*G.T.*

6J–255 551.578.11 551.509.67

Ogiwara, Sekiji and Kobayashi, Teisaku (*both, Institute of Low Temperature Science, Hokkaido Univ.*), **On the growth of water droplets around hygroscopic particles in convective cloud and its application to the artificial precipitation.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:42–45, **1954.** 4 tables, 4 figs., 9 refs., 19 eqs. Reviewed in French by J. Dessens in *Puy-de-Dôme. Observatoire, Bulletin, Ser. 2*, No. 1:16–17, Jan./March **1955. DWB**—There have hitherto been a number of careful studies (either theoretical or observational) on the formation of rain drops in warm cloud with large hygroscopic particles as nuclei. It is generally accepted that hygroscopic particles in a convective cloud cause the condensation to occur in the initial stage and droplets thereby grown to a certain extent continue to develop by coalescence with other smaller droplets. In the present work, the degree of supersaturation in a convective cloud was first estimated with the aid of WEICKMANN and AUFM KAMPE's observational data (1) concerning the physical properties of cumulus clouds, and then the growth of water droplets around hygroscopic particles by condensation and coalescence was studied. It was concluded that a droplet containing more than about 10^{-10} g of sea salt will be able to become a rain drop in convective droplet cloud. Applying this result to the artificial precipitation, we seeded cumulus cloud with sodium chloride particles sprayed from ground-based generators. The effect of seeding was analysed from both synoptic and statistical points of view. *Subject Headings:* **1. Raindrop formation 2. Artificial precipitation.**—*Authors' abstract.*

6J–256 551.574.2:551.578.41

Ôkita, T. and Kimura, K., **Ice crystal growth in the atmosphere.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 32(5/6):129-142, May/June **1954.** 11 figs., 15 photos., 2 tables, 10 refs. **MH-BH**—Dense steam fog in winter along rivers in Asahikawa, Hokkaido, was seeded with silver iodide nuclei by means of a new type silver iodide generator and the growth of ice crystals in the fog was observed. Various forms of ice crystals were produced, plates being predominant. A relatively small number of columns and capped columns were also found. Many stellar crystals were formed on March 14 when weather conditions were supposed to be favorable for the growth of these crystals. The observed sizes showed good agreement with the value predicted by HOUGHTON within about 150 m from the generator, but at larger distances the size became smaller than predicted. This probably suggests that larger crystals had fallen upon the ground through the shallow fog layer before they were carried to distant places. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Ice crystal growth 3. Fog effects 4. Japan.**—*Authors' abstract.*

6J–257 551.509.67

Orville, Howard T. (*Bendix Aviation Corp., Baltimore*), **Present status of weather modification.** *New York Academy of Sciences, Transactions*, Ser. 2, 17(1):45–51, Nov. **1954.** 6 refs. **DLC**—History of attempts at cloud seeding from 1930 (VERAART) to date, and aims of the U. S. Advisory Committee on Weather Control are reviewed. Several projects already carried out by the Advisory Committee, and categories into which types of activity or information are divided (acceptable, doubtful and very doubtful information) are outlined. Economic value of report to be submitted in 1956 by the Committee, regardless of whether positive or negative, is suggested. *Subject Headings:* **1. Cloud seeding 2. U. S. Advisory Committee on Weather Control.**—*M.R.*

6J–258 551.509.6

Orville, Howard T. (Chairman, U. S. Advisory Comm. on Weather Control), **Weather made to order?** *Colliers*, N. Y., 133(11):25–29, May 28, **1954.** illus. (col.), photos, port. **DLC**—A report on the possibilities of controlling weather for civilian or military purposes by means of cloud seeding techniques developed since 1946, and on the more accurate and specific weather forecasts which may be expected in 10 years if a stepped-up observation and instrumentation program for a close network of stations were carried out. If several billion dollars were spent on research in weather control over 40 years, it might be possible to control drought, hail, thunderstorms, tornadoes, floods, snow, fog, clouds, etc. (*Same item as* 6.2–89, Feb. 1955, *MAB.*) *Subject Headings:* **1. Weather control 2. Cloud seeding.**—*M.R.*

6J–259 551.509.

Pavelis, George A. (*Mont. State Coll., Bozeman*), **Economic and social aspects of weather contr** *Montana Academy of Sciences, Missoula, Proceedings*, 14:45–47, **1954.** 5 refs. **DA**—Author ca for a clear understanding of the limitations of cloud seeding, for better coordination between grou sponsoring weather modification operations, and for information to be made available to an "i partial group evaluating experimental or commercial operations." *Subject Headings:* **1. Weath control 2. Cloud seeding evaluation.**—*G.T.*

6J–260 551.577.

Pavie, Ch., **La création de nuages pluvigènes.** [Formation of rain clouds.] *Almana Agricole Tunisien*, Tunis, **1954.** p. 409–422. **DA**—General discussion of the natural formation rain clouds. By trying to preserve and build up water resources in arid regions instead of depleti them, a natural equilibrium of the elements required for precipitation formation could be achieve *Subject Headings:* **1. Precipitation formation 2. Atmospheric water balance.**—*G.T.*

6J–261 551.509.

*Pire, J. J., **Essais de pluies artificielles à Temvo, Congo Belge en mars 1954.** [Artificial ra at Temvo, Belgian Congo, March 1954.] *Belgium. Académie Royale des Sciences Coloniale* 25(5):1560–1575, **1954.** fig., tables (91 fold.), 7 refs. **DLC**—Results of AgI seeding tests in t Temvo region of the Belgian Congo at 8 experimental and 22 control stations (upwind from ge erators) on 7 experimental and 22 control days in March 1954 are presented in detailed tabular for and analyzed statistically for significance of tests. Although less rain fell on the experimental tha on the control days, it was concluded that the results of the seeding were too high to occur by chan at the .001 confidence level, and that the rainfall at the 8 experimental gages was more than th at the 22 test stations so as to be beyond the .01 confidence limit. This apparent anomaly is d to the fact that the seeding days were generally less rainy than the control days. *Subject Heading* **1. Cloud seeding in Belgian Congo 2. Temvo, Belgian Congo.**—*M.R.*

6J–262 551.509.

Piriz, Nestor A., **Lluvia artificial en el Uruguay.** [Artificial rain in Uruguay.] *Revista Orie tación Meteorológica*, Montevideo, No. 7:33–34, June **1954. MH-BH**—Rainmaking experiments Uruguay are conducted with a novel technique described in this article. The technique is bas on the fact that if the electron equilibrium in a cloud is disturbed, a sudden growth of the clo droplets by coalescence may ensue. Since clouds have a negative charge, the introduction of positive field will lead to the desired effect. This is achieved by means of ionized aluminum powd exploded in the cloud. On April 10, 1954 rain was produced from a stratocumulus (showing litt promise of rain) over an area several km in diameter. This experiment was carried out before selected audience comprising public figures and representatives of press and radio. (*Same item* 6.6–137, June 1955, *MAB.*) *Subject Headings:* **1. Cloud seeding with ionized aluminum 2. Urugua** —*G.T.*

6J–263 551.575.1:551.509.

Plank, Vernon G., **Fog modification by cold-water seeding.** *U. S. Air Force. Cambrid Research Center, Geophysical Research Papers*, No. 31, Aug. **1954.** 21 p. 6 figs., 3 tables, 9 re **DWB, DLC**—Heat and mass transfer processes associated with the passage of a cold drop throu a volume of fog are reviewed. The role of the thermal relaxation mechanism is pointed out a thermal relaxation times for 100μ and 1000μ drops are computed for saturated and foggy conditio Diffusion and coalescent growth processes are described and the equations of these processes a utilized in conjunction with thermal relaxation curves to compute the mass acquired by 100μ a 1000μ drops at °C falling through 20 m of 10°C fog. The recondensation process, the effectiven of the coalescence mechanism in improving fog visibilities and the probability of using B-29 tank aircraft for water seeding operations are discussed. A table showing the probable visibility i provements resulting from maximum seeding concentration is presented. *Subject Headings:* **1. Ar ficial fog dissipation 2. Cloud seeding with water.**—*Based on author's abstract.*

6J–264 551.578.7:551.509.

Quate, Boyd E. (*Water Resources Development Corp.*), **Cloud seeding and its application to h suppression.** *Idaho State Horticultural Society, Transactions*, p. 38–41, **1954.** Mimeo. **DA**—T principles of hail suppression by overseeding with silver iodide, as practiced by Water Resour Development Corporation under I. P. KRICK, are explained. The author concludes by stati that while "it does not seem feasible as of this date to completely eliminate hail, there is positi evidence that the maximum size to which hail stones would normally grow can be reduced with considerable reduction in the maximum damage that would result." *Subject Headings:* **1. H prevention 2. Overseeding.**—*G.T.*

6J–265 551.509.67:551.578.7

Rainmaking—a new twist. *Chemical and Engineering News*, 32(43):4352, Oct. 25, **1954.** **DLC**—At Longkloof, South Africa, farmers are practicing hail control by means of rockets dispersing gI crystals. The technique was suggested by H. KRITZINGER of Stellenbosch University. The ost of a rocket is $14. "In a matter of minutes after the rockets are fired, harmless rain falls from enacing hail clouds." *Subject Headings:* **1. Hail prevention in South Africa 2. Silver iodide ockets 3. Longkloof, South Africa.**—*G.T.*

6J–266 551.577.2(54)

*Rai Sircar, N. C. and Hariharan, P. S. (*Met. Off., Poona*), **The density of reporting network ecessary for proper appraisal of the occurrence of rainfall in small areas in different localities i India in various seasons.** *Indian Journal of Meteorology and Geophysics*, Delhi, 5(3):219–229, ıly **1954.** 20 figs., 4 tables, 2 refs. **MH-BH**—A study has been made of the minimum density network of rain gage stations necessary for a proper appraisal of the character of rainfall in a given nall area. Apart from the statistical value of the results obtained, this study has thrown some seful light in regard to our criteria for the assessment of rainfall forecasts for small areas such as ıose included in the Farmers' Weather Bulletins. Some of the findings of the study are of particular terest. For example, while one would conclude, on the basis of data of Calcutta alone, that the ability of the area around the station to get rain of 10 cm or more during the premonsoon season only 11 for every 100 days, the analysis based on data of all rain gage stations within 50 miles round Calcutta shows that on as many as 53 per cent days one or more stations in that area is kely to have rain of 10 cm or more. Similar findings, as have been obtained for other areas and other seasons, are of value in connection with the districtwise forecasts that are being issued for ıe use of farmers. *Subject Headings:* **1. Rainfall networks 2. Rainfall normals 3. Rainfall valuation 4. India.**—*Authors' abstract.*

6J–267 551.509.67

Réunion d'automne de l'Association d'Études des Moyens de Lutte Contre les Fléaux Atosphériques. [Autumn meeting of the Research Association for the Control of Weather Disasters.] *uy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 4:121, Oct./Dec. **1954.** Also: **Une discussion sur s essais de pluie artificielle à l'Assemblée Nationale.** [Discussion on artificial rainfall experiments efore the National Assembly.] *Ibid.*, p. 122–124. refs. **MH-BH**—The first item is a note on ail control activities in the Aquitaine basin, France, in the 1954 season, which was the 4th year of lver-iodide seeding in that area. In 1954 the hail control network consisted of 70 ground-based enerators arranged in several lines. The small number of hailstorms during the operations justifies ntinuation of the project in 1955. The second paper is a verbatim passage from the official inutes of the parliamentary debate of July 22, 1954. In reply to a question by A. REY, the Secretry of Commerce of France, P. MONIN, explains the circumstances under which a 2-year contract volving 70 million francs was concluded between Electricité de France and the Water Resources evelopment Corp. of the U. S. Dissatisfied with the Secretary's explanation, REY expresses dignation because the contract was awarded to a foreign corporation of doubtful scientific standing, hile highly rated research organizations in France, equally capable of conducting cloud-seeding xperiments, have to pursue their studies on less than 10% of the sum made available to the American ainmakers." *Subject Headings:* **1. Hail prevention in France 2. Cloud seeding in France France.**—*G.T.*

6J–268 551.577.11

Roulleau, J., **La formation de la pluie.** [Rain formation.] *La Météorologie*, 4th Ser., No. 35: 21–230, July/Sept. **1954.** 11 figs., table, eq. French, English and Italian summaries p. 221. **WB**—A technical review of theories and knowledge of cloud physics, natural rain or hail formation nd artificial triggering of precipitation beginning with the BERGERON theory in 1933 and revised by rtue of recent studies of coalescence, and other methods of drop accretion. Radar studies are so described and illustrated. *Subject Headings:* **1. Precipitation formation 2. Radar analysis of in 3. Artificial precipitation.**—*M.R.*

6J–269 551.509.67

Roulleau, J., **La pluie artificielle.** [Artificial rain.] *La Houille Blanche*, Grenoble, 9(1):38–42, n./Feb. **1954.** English summary p. 38. Digest and discussion, *Ibid.*, Special No. B, 8:698–700, ov. **1953. DLC**—In this general treatment of the problem of rainmaking, the natural mechanism rain, the effect of cloud seeding and the usefulness of rainmaking are discussed. While emasizing the utility of cloud seeding in various situations the author nevertheless makes it clear at it does not appear to be possible so far to modify precipitation of large cloud systems connected ith major perturbations. The effectiveness of cloud seeding is limited to shower clouds. (*Same em as* 6.1–111, Jan. 1955, *MAB.*) *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

6J–270 551.509.67

Sakanoue, Tsutomu (*Kyushu Univ.*), **Outline of the research of rainmaking in Kyushu district.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:28–30, **1954.** Also: Takeda, Kyoichi and Sakanoue, T., **Research on rain-making in Kyushu area.** *Ibid.*, p. 115–140. 19 figs., table, 5 refs., 2 eqs. **DWB**—Detailed description of method and equipment used in cloud seeding experiments in Kyushu (1952–1953). In these experiments dry ice or AgI was released from balloons. Results were evaluated with the help of surface and upper air charts, rawin observations and a dense raingage network. The ascents are discussed individually and some of them found to have shown significant results. *Subject Headings:* **1. Cloud seeding in Japan 2. Kyushu, Japan.**—*G.T.*

6J–271 551.509.67

Serpolay, R., **Résultats des essais de modification des précipitations effectués en Algérie pendant la campagne 1951–1952.** [Results of rainfall modification experiments carried out in Algeria during the 1951–1952 season.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 1:27–31. Jan. **1953.** fig., 4 refs. Also his: **Essais de modification . . . 1952–1953.** *Ibid.*, No. 1:6–15. Jan./March **1954.** 5 figs., 9 refs. Also his: **Essais de modification . . . 1953–1954.** *Ibid.*, No. 4:109–112, Oct./Dec. **1954.** fig., 2 refs. **DWB**—First article: Silver iodide generators were placed on a line running NNE–SSW, perpendicular to the prevailing wind direction through Algiers. From 28 Dec. 1951 to 30 April 1952, 13 experiments were carried out. Three experiments leading to rainfall had a possible relationship to AgI seeding; six attempts had a dubious relationship; and in four, the results were independent of the seeding. Second article: Between Sept. 1952 and April 1953 63,275 kg of AgI were employed during 104 days to seed cumuliform clouds. On 13 (or 50%) of the attempts very heavy rainfall occurred near and in the lee of generators, as compared with the control area. A comparison of the rainfall distribution and amount during the experimental period with a 12-year normal for this period indicates a definite increase in rainfall during 1952–53 as compared with the normal. The rainfall distribution and deviations are shown on maps. Third article: In 1953–54 seeding was conducted on 84 days. Two large charts show departure of Sept.–April 1953–54 rainfall over 1939–1951, with area of positive anomaly centered in all directions around the line of seeding, and another showing corrected anomalies (leaving out snow days in Feb. and days with cloudburst in April) with area of positive anomaly extending far to the east and not at all to the west of the line of seeding, indicating a slight (+14%) amount of effectiveness downwind, ranging from 2% to 38%. *Subject Headings:* **1. Cloud seeding in Algeria 2. Algeria.**—*I.L.D., M.R.*

6J–272 551.509.67

Sinclair, Gerald (*Farm land assistant*), **South Dakota rain increase analysis—five areas, 1953. Supplemented by rain increase analysis by specific months for 1951, 1952, 1953.** Brookings, South Dakota State College, [**1954?**] 17 p. figs., tables. **DWB**—During the summer of 1953 cloud seeding in South Dakota affected 5 areas for periods of varying length. This report sums up the results of an evaluation of data supplied by the Water Resources Development Corp. The evaluation method used includes the "percentage of normal" and a formula derived from a regression method. Results indicate an overall average 16% increase in precipitation. In a supplementary table an example is shown of cloud seeding evaluation on the basis of selected months (with large number of seeding opportunities), and choice of target and control area along the same storm path. *Subject Headings:* **1. Cloud seeding evaluation 2. Cloud seeding in South Dakota 3. South Dakota.**—*G.T.*

6J–273 551.509.67

Sincock, Robert L., **Test plots for cloud seeding.** *Oregon Farmer*, Portland, 77(15):6–7, Aug. **5, 1954.** photo. **DA**—Describes rain prevention operations sponsored by Yakima Valley, Wash., cherry growers and conducted by meteorologist JACK HUBBARD. Rain prevention efforts are being made while rainmaking operations are going on in nearby Horse Heaven Hills. HUBBARD's project was started experimentally in 1951 and has been pursued commercially since 1952. Qualitative results are indicated. The seeding technique involves burning of two unidentified fume-yielding chemicals. Their effect is not believed to be based on overseeding but possibly something resembling catalytic action. *Subject Headings:* **1. Artificial cloud dispersal 2. Rain prevention.**—*G.T.*

6J–274 551.509.67

Street, A. G., **Must they make more rain?** *Farmers Weekly*, London, 41(21):75, Nov. 19, **1954.** photo. **DA**—In this discussion of current problems in farming, the author takes up, among other topics, the news of rain making experiments to be carried out on Salisbury Plain in the spring of 1955. He suggests with rustic directness that scientists stop meddling with the weather. *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

6J–275 551.509.67

Sugawara, Ken and Sano, Isamu (*Nagoya Univ.*), **A brief account of the cloud stimulation search in Chubu district.** *Committee for Rain-making in Japan, Tokyo, Report of Rain-making Japan*, 1:17–23, **1954.** 3 figs., table, 3 refs., 2 eqs. **DWB**—A research program on cloud seeding as started in Chubu District, Japan, in July 1952 with the co-operation of Chubu Electric Power o., Nagoya University and Nagoya Local Meteorological Observatory. In this report the following hases of the program are discussed: 1) construction of the smoke generators (a light oil-combustion pe and a propane combustion type AgI smoke generator), 2) analysis of the purity of AgI smoke, investigation of the atmospheric diffusion of AgI smoke and 4) formation of snow along the path AgI smoke in a field experiment at Takayama, Gifu Prefecture. *Subject Headings:* **1. Cloud eding in Japan 2. Chubu District, Japan.**—*G.T.*

6J–276 551.509.67

Symposium on Artificial Rain held at New Delhi on Feb. 9–10, 1953. *International Union of eodesy and Geophysics, Bulletin d'Information*, 3(5):161, April **1954.** Also: **Meeting of the Atospheric Research Committee held on 11th February, 1953, at Meteorological Office, Lodi Road, ew Delhi.** *Ibid.*, p. 161–162. **DWB**—First article: More than 20 papers were read and discussed this meeting. The papers were grouped under 2 headings: 1) Cloud and precipitation physics id 2) Experimental rain making in India. Discussions included 1) growth of cloud drops by alescence, 2) rain from nonfreezing clouds, 3) radar precipitation detection and 4) heights and pes of low clouds over India. V. V. SOHONI, Director General of Observatories at the time, esided. Second article: Recommendation for a cloud physics unit at Poona, and a rain research nit at Delhi. Recommended that S. K. BANERJI's balloon seeding experiments be continued, id studies of infrared solar radiation (RAMDAS), ozone and weather (K. R. RAMANATHAN), storm icroseisms and sea waves (S. K. CHAKRAVORTI) and upper atmospheric potential gradient (S. P. ENKITESHWARAN) be continued. *Subject Headings:* **1. Cloud physics conferences 2. Artificial ecipitation symposia 3. Cloud seeding research 4. Upper atmosphere research 5. Microseism search 6. New Delhi, India.**—*M.R.*

6J–277 551.509.67

Takahashi, Yoshiniko (*Met. Res. Inst., Tokyo*), **Artificial rain-making in Kanto district.** *Comittee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:15–16, **1954.** 9 refs. **WB**—Brief general account of cloud seeding experiments and laboratory studies conducted in 52 under the sponsorship of Tokyo Electric Power Company. A list of 9 papers reporting results the program is added. *Subject Headings:* **1. Cloud seeding in Japan 2. Kanto District, Japan.** *G.T.*

6J–278 551.509.67

Takahashi, Yoshihiko (*Met. Res. Inst., Tokyo*), **On the cloud seeding experiments in Kanto id Chubu districts in the summer of 1952.** *Committee for Rain-making in Japan, Tokyo, Report Rain-making in Japan*, 1:69–76, **1954.** Also in: *Papers in Meteorology and Geophysics*, Tokyo, (2):165–172, Sept. **1954.** 11 figs., 6 refs. **DWB**—Two large scale experiments on cloud seeding ere made in the summer of 1952 following the present author's suggestion that silver iodide smoke ould be released in less turbulent wind at a high level by the seeding operation on the top of a high ountain. In the experiment of Tokyo Electric Power Company charcoal burners of silver iodide ere employed, and in the experiment of Chubu Electric Power Company the improved light oil rnace type smoke generators after the present author's design were employed. The seedings were ore or less effective in many cases. Two excellent results are illustrated. The lateral and vertical preading of silver iodide smoke by turbulent diffusion in the air was made known to some extent om the results of the experiments. *Subject Headings:* **1. Cloud seeding in Japan 2. Japan.**—*uthor's abstract.*

6J–279 551.509.67

*Takahashi, Yoshihiko (*Met. Res. Inst., Tokyo*), **Record of cloud seeding in Japan, 1947–1954.** *ommittee for Rain-making in Japan, Tokyo, Report of Rain-making in Japan*, 1:31–41, **1954.** enrely tables. **DWB**—Sums up information on cloud seeding experiments conducted under the ponsorship and with the participation of the electric power companies of Hokkaido, Tohoku, okyo, Chubu, Kansai and Kyushu. With the exception of a single inconclusive experiment in yushu (Nov. 1947) the experiments were made in 1951–1954. Details of 28 seeding operations nging in duration from one day to three months, are described. The information tabulated mprises the following items: 1) Date, 2) Personnel, 3) Method and equipment, 4) Place, weather id cloud conditions, 5) Details of operation and 6) Results (mostly qualitative). Several instances precipitation in seeded areas far in excess of control areas are reported. *Subject Headings:* **1. Cloud eeding in Japan 2. Japan.**—*G.T.*

6J–280 551.509.67

Taylor, Frank J., **They make rain when the clouds roll by.** *Reader's Digest*, Pleasantville, N. Y., 65(388):135 138, Aug. **1954. DLC**—World wide services in attempts at artificial rainmaking (weather modification) by IRVING KRICK and his Water Resources Development Corp., which in 4 years has grown into a million-dollar business, are summarized in this condensation of an article in *Prairie Schooner*, (Univ. of Nebraska Press), for Summer **1954.** Cloud seeding projects using silver iodide carried out in Spain in 1952–3, in the Horse Heaven Hills of Washington in 1950, and in the Dallas-Fort Worth area in 1952 53, are described and the success evaluated. *Subject Headings:* **1. Cloud seeding in Spain 2. Cloud seeding in U. S. 3. Spain 4. Texas 5. Horse Heaven Hills, Wash.**—*M.R.*

6J–281 551.509.67

Tindall, Cordell, **Will cloud seeding bring more rain?** *Missouri Ruralist*, p. 6, 38–39, Feb. 13, **1954.** fig., photos. **DLC**—Discusses planned cloud seeding project to be sponsored by a pool of farmers over a territory comprising several counties in Missouri. The program would be carried out by the Weather Corporation of America headed by W. HARTNETT. Missouri College of Agriculture plans to evaluate results of the seeding operations. Scientific, financial and legal aspects of rainmaking are discussed. *Subject Heading:* **1. Cloud seeding projects.**—*G.T.*

6J–282 551.509.67

Tominaga, Hitoshi and Kinumaki, Susumu, **Note on a method of spraying AgI-in-Liq. NH_3 solution for the purpose of the artificial seeding.** *Tohoku University, Science Report, 5th Ser., Geophysics*, 6(1):39–42, Aug. **1954.** 8 figs., 2 tables, 3 refs. **MH-BH**—AgI is very soluble in liquid NH_3. Hence apparatus was devised to spray such a solution into clouds instead of using charcoal smoke or hydrogen flames. Device is illustrated schematically and photographically, and particles shown in electronmicroscope photographs enlarged 7500 and 15,000 times. Distribution of particle size shown to be predominantly <100Å. Data on surface tension vapor density, etc. are tabulated. Corrosion of containers or metal parts by solution was found to be negligible after 10 minutes. Method seems as good as VONNEGUT's. *Subject Heading:* **1. Silver iodide smoke generators.**—*M.R.*

6J–283 551.509.67

United Nations. Dept. of Public Information, **Rainmaking: a study of experiments.** *United Nations, Publications*, [unnumbered], Jan. 22, **1954.** 18 p. photos. Also in: *United Nations Review*, N. Y., 1(1):18–25, July **1954. DWB**—A general survey of successes and failures in rainmaking in various parts of the world—notably Tanganyika in 1951/52 (AgI exploded into cloud with gunpowder by means of hydrogen balloons), India (1952) where in 1948–51 90% of cloud tops were below freezing level (7285 aircraft reports), Australia, Argentina, Peru, Pakistan (salt on ground or from airplanes—1953), U.S.A. and Central America. Claims to limited success in some cases are stated with reservation, but need for more extensive tests and careful evaluation expressed in strong terms. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding techniques. I. World Meteorological Organization.**—*M.R.*

6J–284 551.509.67

U. S. Congress. House. Committee on Appropriations, **Third supplemental appropriation bill, 1954. Hearing before subcommittees, 83rd Congress, Second Session.** Washington, D. C., Govt. Print. Off., **1954. DLC**—P. 182–194 treat requested budget for the Advisory Committee on Weather Control. H. T. ORVILLE, chairman of the Advisory Committee answers questions on the scope of work contemplated by his Committee for the next 2 years, and gives an outline of proposed expenditures and justification for various items in his budget (proposed staff, travel, etc). The initial work by a small staff of experts, working with the Advisory Committee, will be to collect reports and data on cloud seeding activities in the U. S. and possibly abroad and to evaluate the effectiveness of these efforts (both beneficial and detrimental) with a view toward recommending Federal legislation to control such activities if found necessary. (*Same item as* 6.6-139, June 1955 *MAB.*) *Subject Headings:* **1. U. S. Advisory Committee on Weather Control 2. Cloud seeding evaluation 3. Weather control budget. I. Orville, H. T.**—*M.R.*

6J–285 551.509.67

U. S. Congress. Senate. Committee on Appropriations, **Third supplement appropriation bill, 1954. Hearings before the Committee, 83rd Congress, Second Session, on H.R. 4841.** Wash., D. C., Govt. Print. Off., **1954. DLC**—P. 60–69 treat requested budget for the Advisory Committee on Weather Control. The presentation contains a statement of the program of the Committee; a description of planned composition of its staff; a statement by the Department of Agriculture on the importance of weather modification, in particular artificial rainfall to agriculture; a brief state-

ent on the extent of cloud seeding operations carried on in the U. S. and abroad and short bio-raphical sketches of the private and public members of the Committee. (*Same item as* 6.5–83, ay 1955, *MAB.*) *Subject Headings:* **1. U. S. Advisory Committee on Weather Control 2. Weather ontrol budget 3. Cloud seeding in the United States 4. Biography.**—*I.L.D.*

6J–286 551.576.1:551.509.6

Vaillant, J., **Est-il possible de provoquer des ascendances génératrices de cumulus de con-ection thermique?** [Is it possible to create updrafts which will produce convective cumulus?] *uy-de-Dôme. Observatoire, Bulletin,* Ser. 2, No. 4:103–107, Oct.–Dec. **1954.** fig. **DWB**—Sug-ested means of inducing artificial convective clouds where no clouds exist, by superheating small eas with the aid of solar energy. An experimental area of 200 to 500 ha for thermal convection udies is proposed for Algeria using large areas of shallow water (0.3 to 0.8 m depth) with island the middle which would be relatively hot. *Subject Heading:* **1. Artificial convective cloud gen-ation.**—*M.R.*

6J–287 551.509.6:551.542.1

Weiller, A. R., **Les tempêtes artificielles sont-elles pour demain?** [Will artificial gales be oduced tomorrow?] *La Météorologie,* 4th Ser., No. 34:127–136, April/June **1954.** 12 figs., ref., eqs. English and Spanish summaries p. 127. **MH-BH**—In this theoretical analysis of the namics of gradient winds, it is shown how strong winds might be induced in certain synoptic uations by sudden changes in the pressure gradient. Such changes could be caused by atomic plosions. Without going into the technical or economical feasibility of such an enterprise, the uthor merely suggests that nuclear explosion might be more effectively used in weather modification an present cloud seeding practices. After the thermonuclear explosion on Eniwetok in March 954 radioactive fallout was reported in unexpected areas; the explosion was found to be twice as owerful as anticipated. These facts indicate that the baric field may have been disturbed and rong winds produced. (*Same item as* 6.8–256, Aug. 1955, *MAB.*) *Subject Headings:* **1. Weather ntrol 2. Artificial winds 3. Gradient winds 4. Atomic explosions.**—*G.T.*

6J–288 551.509.67:632.187

Wetterer, Charles S. (*W. E. Howell Assoc., Inc., Cambridge, Mass.*), **Rainfall stimulation for rest fire prevention and control.** *Pulp and Paper Magazine of Canada,* Montreal, 55(7):166–173, ne **1954. DA, DLC**—In this talk presented at a Woodlands Section Annual Meeting in Montreal, e author begins with the historical and physical background of rainmaking. He then discusses e role of sponsoring agencies and of professional "rainmakers" in organizing cloud seeding projects. nally, he shows applications of cloud seeding not only to lowering forest fire danger but to com-ting actual forest fires. An example of a successful achievement of this latter purpose is given. *ubject Headings:* **1. Cloud seeding 2. Forest fire control.**—*G.T.*

6J–289 551.509.67

†World Meteorological Organization, **Artificial inducement of precipitation with special reference the arid and semi-arid regions of the world.** Its *Technical Note,* No. 1; *WMO* [*Publication*] o. 24 TP 7, **1954.** 24 p. 87 refs. Price: Sw.fr.1. **DWB**—This review of world-wide weather odification efforts is based on replies received to a preliminary inquiry made by the WMO Secre-riat. It includes: 1) a brief critical study of results achieved by the various projects, 2) a general alysis of atmospheric conditions favoring rainmaking experiment in various countries, 3) a survey d tentative evaluation of current techniques and 4) a list of references arranged by continents. is found that (a) operations hitherto carried out proved inconclusive, (b) regions and seasons voring natural precipitation are also most favorable for artificial inducement of precipitation and) "present-day techniques have very little value, if any, in augmenting the precipitation in areas very low rainfall or during dry periods in regions of normally medium rainfall. Scientifically gorous experimentation, development of precise methods of evaluation, collaboration with meteoro-gical authorities and exchange of information are recommended. *Subject Headings:* **1. Review ticles 2. Weather modification bibliographies.**—*G.T.*

6J–290 551.509.67

Yamamoto, G. (*Tohoku Univ.*), **Artificial rain-making in Tohoku Region.** *Committee for Rain-aking in Japan, Tokyo, Report of Rain-making in Japan,* 1:8–14, **1954.** 3 tables, 3 figs., 3 refs., . **DWB**—General account of cloud seeding experiments conducted in the Tohoku region in mmer 1953, and of theoretical and synoptic studies undertaken in connection with the experiments. these experiments AgI generators were operated on the ground. The amount of data obtained found insufficient for definite conclusions. *Subject Headings:* **1. Cloud seeding in Japan Tohoku, Japan.**—*G.T.*

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6J–291 551.509.6

*Alpert, Leo (*Capitol Res. & Dev. Corp., Arlington, Va.*), **Silver iodide cloud seeding in Puerto Rico.** *American Geophysical Union, Transactions*, 36(2):227–234, April **1955.** 5 figs., 2 tables 16 refs. **MH-BH**—The results of field work in Puerto Rico in Nov., 1953, as a consultant for the Puerto Rico Water Resources Authority to investigate the possibilities of stimulating rainfall through cloud seeding with silver iodide ground generators are reviewed. Few opportunities for cloud seeding with silver iodide ground generators were observed. Most often rain fell from warm cumulus clouds with tops between 8000 and 12,000 ft, far below the −5°C level between 17,000 and 18,000 ft where silver iodide first becomes effective as a nucleating agent. Few cumulus grow to the −5°C level between 17,000 and 18,000 ft. Those that were observed to grow to the −5°C level where silver iodide crystals might be effective started to give rain when the tops were between 8000 and 12,000 ft, and those clouds usually yielded such intense showers that seeding to increase the fall might result in destructive erosion and floods. An analysis of the meteorological records for the dry season indicates that the trade inversion would form an effective ceiling to the penetration of the silver iodide smoke aloft. *Subject Headings:* **1. Cloud seeding in Puerto Rico 2. Height of tropical Cu clouds 3. Rain from nonfreezing clouds 4. Puerto Rico.**—*Author's abstract.*

6J–292 551.509.6

Aujeszky, László, **A mesterséges esőkeltés újabb fejleményei.** [Recent developments in artificial stimulation of rainfall.] *Hidrológiai Közlöny*, Budapest, 35(3/4):137–142, March/April **1955.** fig., 3 photos (Inserted between p. 116–117), 16 refs. **DWB**—In this thorough review of current problems in cloud seeding the author discusses: 1) the physics of precipitation, 2) selection of meteorological conditions favoring seeding, 3) various seeding agents, 4) feasibility and usefulness of systematic cloud seeding, 5) impact of cloud seeding on hydroelectric power and 6) the question whether artificial precipitation occurs at the expense of natural precipitation. It is contended that the hydrologic cycle may be intensified by artificial precipitation (increased evaporation as a result of precipitation increase) and thus a higher general rainfall amount (instead of a mere re distribution) may be obtained. *Subject Heading:* **1. Artificial precipitation.**—*G.T.*

6J–293 551.509.67:551.578.

Beck, F. X., **Hagel-Abwehr.** [Hail prevention.] *Umschau*, 55(13):404–406, July 1, 1955 4 figs., 2 refs. **DLC**—A sketch is given of the formation of hail in a cumulonimbus. Prevention is by the introduction of condensation nuclei (AgI) which inhibit excessive supercooling. Airplane and surface generators do not take them high enough, but rockets can penetrate the supercooled region and are simple and cheap. Early recognition of a dangerous cloud is essential; this can be by radar and by warnings from a central office. (*Same item as* 6F–378, June 1955, *MAB.*) *Subject Headings:* **1. Hail prevention 2. Overseeding.**—*C.E.P.B.*

6J–294 551.509.6

Berényi, Dénes, **Újabb kisérletek mesterséges eső előállítására Keletafrikában.** [Recent experiments on artificial stimulation of rainfall in East Africa.] *Időjárás*, Budapest, 59(2):126–127 March/April, **1955. DLC**—Describes balloon bomb technique for obtaining precipitation from non-freezing clouds by seeding with hygroscopic nuclei as practiced in East Africa and reported by D. A. Davies (*Nature*, London, 1951, 1952 and 1954; *see* 6J–101 and 6J–226). *Subject Headings:* **1. Cloud seeding with hygroscopic nuclei 2. Balloon bomb technique 3. East Africa. I. Davies, D. A.**—*G.T.*

6J–295 551.509.67:01

†**Bibliography of published reports on cloud physics and weather modification.** [1953.] *California. State Water Resources Board, Bulletin*, No. 16 (Append. B): 69–78, June **1955.** entirely refs. **DWB**—Reference is made to the **Selective Annotated Bibliography on Cloud Physics and Rain Making,** in *Meteorological Abstracts and Bibliography*, March 1950, to a bibliography on the same subject in the *American Geophysical Union, Transactions*, Dec. 1952, and to a bibliography of nuclei added to Appendix G of this Bulletin. Published reports which do not appear in any of the mentioned bibliographies are listed here. The list includes some 120 references to literature of cloud physics, precipitation mechanics and weather modification. American and foreign literature is covered up to Sept. 1953. *Subject Headings:* **1. Cloud physics 2. Weather control 3. Weather modification bibliographies.**—*G.T.*

6J–296 551.509.

Blumenthal, Fred, **Scientists are changing the weather.** *Washington Post Parade Magazine* April 3, **1955,** p. 10–12. photos, diagr. **DLC**—Popular article giving the optimistic claims of cloud seeders or "rainmakers" (extinguishing forest fires, clearing holes in clouds for rescue operations fog dispersal for airports or moving picture production, snow making for various purposes, seeding

hurricanes, curing drought, etc.) followed by notes on conservative side and the work of the Orville Commission which must make its report by June 30, 1956 on the facts of this controversial subject. Methods, benefits and extent of operations are then discussed. (Only 10 states have not had seeding experiments.) Map shows location of seeding trials in U.S.A. *Subject Headings:* **1. Weather control 2. United States.**—*M.R.*

6J–297 551.577.5:551.509.67

Bollay, Eugene, **Methods and results of large scale applications of cloud seeding in the Western United States.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(3):299–318, **1955.** 8 figs., 2 tables, 15 refs. English, German and French summaries p. 299. **DWB**—The economic benefits of even a small increase of precipitation in the dry lands of U.S.A. would be so great that large scale seeding trials were justified. Results of over 50,000 hours of AgI smoke generation are described, including a full scale trial in Santa Barbara County. Evaluation (by the State of California Water Resources Board) was by comparison of rainfall in target and control areas. Precipitation in targets exceeded that in controls by up to 95%; the probability that this arose by chance was of the order of .01. *Subject Headings:* **1. Cloud seeding in Western U. S. 2. Santa Barbara County, Calif.**—*C.E.P.B.*

6J–298 551.509.67

*†California. State Water Resources Board, **Bulletin, No. 16,** June **1955.** 271 p. diagrs. (fold.), charts (fold.), tables, numerous refs. 9 appendixes (p. 58–271). **DWB**—This collection of work on weather modification done under the authority of the California Department of Public Works, Division of Water Resources, contains a description of the organization and authority under which the investigation was undertaken; a summary of the theory of weather modification; a history of cloud physics research and weather modification activities in general and in California (detailed list of recent weather modification operations in California), in particular and a discussion of evaluation methods used by various agencies and those adopted by the reporting agency. Nine supplements—reports prepared under the project—are added as Appendix A–I, as follows:

A: **Laws pertaining to weather modification enacted by 1951 California Legislature,** p. 58–68.
B: **Bibliography of published reports on cloud physics and weather modification.** [1953]. p. 69–78. (*See item* 6J–295.)
C: Jeeves, T. A. et al., **On the methodology of evaluating cloud seeding operations.** April and Oct. **1953.** p. 79–125. (*See item* 6J–313.)
D: Court, Arnold, **Evaluation of weather modification operations of the southern Sierra project.** Oct. **1953.** p. 126–145. (*See item* 6J–300.)
E: Neiburger, M., **Selection of predictors for statistical forecasting of rainfall amounts in the "Carrizo-Tremblor" area of California.** May **1952.** p. 146–162.
F: Vernon, Edward M., **Report on classification of storms for statistical evaluation with special reference to Carrizo plain and Santa Maria coastal areas.** Feb., May, Oct. **1953.** p. 163–193. (*See item* 6J–343.)
G: Snyder, N. W. and Dhanak, A. M., **A study of the measurement of sublimation nuclei by means of ice crystal count and their activation due to temperature.** Aug. **1953.** p. 194–210.
H: Craig, Gavin M., **Legal report on liabilities involved in creation of artificial rainfall and powers of the state to regulate the same.** Aug. 1950, Nov. **1953.** p. 211–257. (*See item* 6J–301.)
I: **Economic report on possible benefits of weather modification operations.** Sept. **1952.** p. 258–271. (*See item* 6J–304.)

Subject Headings: **1. Weather control 2. Cloud seeding evaluation 3. California. Division of Water Resources.**—*G.T.*

6J–299 551.509.67

[Control over the weather through artificial "seeding" of clouds.] *Science*, 122(3163):278–279, Aug. 12, **1955. DLC**—Reports results of ONR Operation SCUD as evaluated by J. Tukey of the Forrestal Research Center, Princeton, N. J. ("No evidence of any large-scale meteorological effects"). Also announces Operation OVERSEED in which AgI generators will be operated at the foot of Mount Washington, N. H., in the fall of 1955. *Subject Headings:* **1. Weather control 2. Cloud seeding with silver iodide 3. Project SCUD (New York Univ.) 4. Operation OVERSEED. I. Tukey, J.**—*G.T.*

6J–300 551.509.67

Court, Arnold (*California Univ., Statistical Lab.*), **Evaluation of weather modification operations of the Southern Sierra project. Oct. 1953.** *California. State Water Resources Board, Bulletin,* No. 16 (Append. D): 126–145, June **1955.** 4 figs. (folded), 5 tables. **DWB**—Weather modification

efforts made during the 1950/51 and 1951/52 seasons over a 2200 sq mi area on the western slopes of southern Sierra Nevada are evaluated by means of a modified regression method comprising differentiation according to 3 precipitation types (Type I, weakening northerly, favoring Yosemite; Type IV, strong westerly, favoring southern Sierra and Type VI, intermediate, favoring neither). Each of the regression lines indicates a relative increase of precipitation in the target area. The probability of this increase being due to a cause other than chance is less than 1/2 if all storms are considered; but if only operational storms are considered, the chances are 85%, 89% and 58% for the four Type I, six Type IV and fourteen Type VI storms, respectively. *Subject Headings:* **1. Cloud seeding in California 2. California.**—*G.T.*

6J–301 551.509.67:34

Craig, Gavin M., **Legal report on liabilities involved in creation of artificial rainfall and powers of the state to regulate the same. Aug. 1950 and Nov. 1953.** *California. State Water Resources Board, Bulletin,* No. 16 (Append. H): 211–257, June **1955.** refs. Addendum, p. 255–257. **DWB**—Some of the complex legal problems connected with a landowner's right in natural rainfall, liabilities of an artificial precipitator, public weather modification and liability therefor, and the state's right to regulate weather modification activities, are discussed in detail. Attempts to give approximate definitions of the extent of these rights and liabilities. "Subject to whatever inherent difficulties there might be in establishing the necessary facts, some degree of liability for damage caused by artificial precipitation to persons or property seems assured." *Subject Headings:* **1. Weather control legislation 2. Legal aspects of weather control.**—*G.T.*

6J–302 551.574.2:551.509.67

Dessens, H., **Quelques théories de l'ensemencement des nuages soumises au contrôle expérimental.** [Some theories of cloud seeding tested experimentally.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 8(3):147–158, **1955.** 6 figs., 32 refs. French, German and English summaries p. 147–149. **DWB**—The importance of the FINDEISEN-BERGERON effect in the first stage of the growth of precipitation is shown by photographs. The effect of seeding by solid CO_2 is dismissed briefly. Laboratory and field experiments with silver iodide are discussed, including evaluation of large-scale tests in France. Doubt is thrown on the efficiency of nucleation from ground emitters, unless the cloud is entirely between 0 and −15°C because: a) after passing through a cloud layer at temperature above 0°C AgI particles may lose their efficiency; b) if the summit of the cloud rises above the isotherm of −15° it may be seeded naturally. *Subject Heading:* **1. Cloud seeding techniques.**—*C.E.P.B.*

6J–303 551.578.41:551.524.3:551.509.67

D'Ooge, Charles L., **Snowfall and temperature on a Californian mountain.** *Nature,* London, 175(4454):465–466, March 12, **1955.** fig., 7 refs. **DWB**—Snowfall and temperature were measured daily at 10,600 ft on White Mts. in winters 1948–54. Cloud seeding experiments were being made on Sierra Nevada Mts. 30 mi upwind. In 1948–51 dry ice was used and peak snowfall was at −11°C. In 1951–54 AgI was used and main peak was at −4°C with a nearly equal peak at −10°C. *Subject Headings:* **1. Temperature of snowfall 2. Cloud seeding 3. Sierra Nevada Mountains, Calif. 4. White Mountains, N. H.**—*C.E.P.B.*

6J–304 551.509.67

Economic report on possible benefits of weather modification operations. Sept. 1952. *California. State Water Resources Board, Bulletin,* No. 16 (Append. I): 258–271, June **1955.** table. **DWB**—A rough estimate of the economic effect of a 10% increase in annual precipitation shows that such an increase would raise the value of dry-farm lands in the Dakotas and Nebraska by 50% and the number of farms might be increased by 30%, thus supporting an additional 56,000 families; in an irrigated region of the San Joaquin Valley, Calif., 10% additional land could be brought under irrigation and power production could be increased considerably. Substantial benefits could also be derived for terrace land, foothills, range land and mountain areas in the regions investigated. *Subject Headings:* **1. Weather control benefits 2. Effects of rainfall increase.**—*G.T.*

6J–305 551.509:6 551.509.67

Edson, Lee, **The world's best weatherman.** *Better Homes,* Des Moines, Iowa, 33(1):48–49, 100–105, Jan. **1955.** photos, diagrs. **DWB**—A well illustrated article describing the advances in meteorology during the past 20 years which can be attributed to Dr. KRICK and his genius. Among these are: 1) modernizing the forecasting procedures of the U. S. Weather Bureau after the fact that Krick's forecasts were 95% correct while the Weather Bureau's were only 65%; 2) development of short and long range forecasting by analogs for commercial interests; 3) forecasting and advising for D-Day landing and the Rhine crossing of allied forces; 4) development of modern industrial meteorology and 5) large-scale cloud modification or rain making developments and operations.

bject Headings: **1. Industrial meteorology 2. Cloud seeding 3. Weather forecasting 4. Krick, ing.**—*M.R.*

6J–306 551.509.67

Gardner, Charles, Jr. (*Ex. Sec., Advisory Committee on Weather Control*), **Hauling down more ter from the sky.** *U. S. Dept. of Agriculture, Water, The Yearbook of Agriculture*, 1955. pub. 55. p. 91–95. **DA, DWB, DLC**—A popular article dealing with the formation of rain, the oduction of artificial precipitation, the statistical evaluation of the effectiveness of cloud seeding d the program of the Advisory Committee on Weather Control. *Subject Headings:* **1. Artificial cipitation 2. Cloud seeding evaluation 3. U. S. Advisory Committee on Weather Control.** *I.L.D.*

6J–307 551.509.67

Godson, Warren L., **Report on evaluation of cloud-seeding operations in Manitoba and Sas-tchewan.** *Canada. Meteorological Division, Circular*, CIR-2649 TEC-215, May 2, 1955. 38 p. igs., 14+8 tables, refs., 11 eqs. Also: American Institute of Aerological Research (Denver, Colo.), **mments [on the above].** Its *Report* No. 274, July 1955. unp. 5 figs., table. **DWB**—Com-rcial seeding operations have been carried out for the months May to July in an area in southwest anitoba (1953, 1954) and in an area in central Saskatchewan (1954). These operations have been aluated by a multiple regression technique involving a number of control areas. Extensive tistical tests have been carried out on monthly areal-mean precipitation data and on regression imate errors. A suitable technique for the combination of estimate deviations from different eas, months, and years has been developed, together with techniques for assessing the significance such a combined estimate of seeding effects. These techniques are applied to the operations ntioned above. It is found that the best estimate of the effect of cloud seeding (AgI ground nerators) is that it has produced a decrease in precipitation, amounting to 14.1% of "natural" cipitation. The 95% confidence range for the seeding effect is between decreases of 0.2 and 6%. There is no indication of any significant differences between areas, months or years. *uthor's abstract.*) In the **Comments** the shortcomings of the evaluation methods applied by DSON are subjected to severe criticism on the following counts: 1) Some of the control areas used re influenced by seeding, 2) The regression method used did not have sufficient accuracy, 3) Short ding periods were combined with long nonseeding periods, thus obliterating the effects, 4) No empt has been made to utilized the more refined methods recently worked out at the University California, 5) "On the strength of an unsound statistical (instead of physical) assessment, GODSON oceeds to draw conclusions concerning the physical conduct of the operations." *Subject Headings:* **Cloud seeding evaluation 2. Cloud seeding in Canada 3. Canada.**—*G.T.*

6J–308 551.509.67

Hales, J. Vern; Hoffer, Thomas E. and Peck, Eugene L., **An evaluation of the effects of cloud eding in southern Utah, April 1951–November 1954.** *Utah. University, Bulletin*, 46(15), June 55. 39 p. figs., photos. **DWB**—The intricate problems of statistical evaluation of cloud seeding erations are discussed in a way easily understood by the layman. In a popular question-and-answer m, the "area average test" applied to the Utah operations is explained. The various steps olved in the test are illustrated with diagrams and photographs. It is found that "the cloud ding did not change the area average percent of normal precipitation." The bulletin includes ticism of reports circulated by the contractor's representative. *Subject Headings:* **1. Cloud seeding aluation 2. Cloud seeding in Utah 3. Utah.**—*G.T.*

6J–309 551.509.67

Hall, W. Ferguson (*U. S. W. B. Scientific Services Div.*), **The Weather Bureau ACN Project.** lk presented at the 135th national meeting of the American Meteorological Society, N. Y. Jan. 1955. Wash., D. C., U. S. Weather Bureau, Feb. 1, 1955. 11 p. table, ref. **DWB**—A total 60 operational flights to test dry ice seeding were made in western Washington State from March May 1953 and Sept. 1953 to May 1954, under a wide variety of cloud conditions attending storms. ly 35 occasions proved satisfactory (22 seeding and 13 control cases) and several good storms were ssed or interruption in seeding occurred because of icing of aircraft. Five evaluations have been de: (1) multiple regression with full target, (2) with small target, (3) space-time interpolation, simple time interpolation and (5) interpolation of results. Visual effects of seeding were noted most cases, regardless of the amount of dry ice distributed in the cloud or the method of distribu-n. Targets were often over 100 mi in length. In 22 periods (66 hours) of seeding 2.25 in. fell; 13 control periods (44 hours) 1.13 in. fell. The 5th method of evaluation gives confidence at 5% el of an increase centered at .008″ per hour and extending from −.001 to +.017. These con-sions must be accepted with caution. *Subject Headings:* **1. Cloud seeding in Washington State**

2. Cloud seeding evaluation 3. U. S. Weather Bureau Cloud Physics Project 4. Western Wash ington.—*M.R.*

6J–310 551.509.67:523

Hemispheric rain-making. *Science News Letter*, Wash., D. C., 67(19):292, May 7, 195 **DLC**—Brief note on BOWEN's well-known theory of meteoric dust being responsible for seedi clouds 30 days after entering atmosphere. AgI is thought to be ineffective if released from groun but would be more effective if sprayed from airplanes or high mountain tops. *Subject Heading* **1. Meteoric dust effect on rainfall 2. Cloud seeding.**—*M.R.*

6J–311 551.509.

Howell, Wallace E., **Artificial rainmaking.** *Paper Trade Journal*, New York, 139(27):24–2 July 4, 1955. 2 figs. **DLC**—Brief discussion of natural rain formation mechanisms and artifici rainmaking from supercooled or warm clouds. Examples of evaluation are shown in two regressio diagrams (Georgetown, S. C., and Escalawapa watershed, Ala.-Miss.). Large increases in rainfa as a result of cloud seeding are mentioned. *Subject Headings:* **1. Artificial precipitation 2. Clou seeding evaluation.**—*G.T.*

6J–312 551.509.

Internationales Symposion für experimentelle Meteorologie, Zürich 4. bis 6. Oktober 195 [International Symposium on experimental meteorology, Zurich, Oct. 4–6, 1954.] *Archiv f Meteorologie Geophysik und Bioklimatologie, Ser. A*, 8(3):145–318, **1955.** 72 figs., numerous ref Also: Murgatroyd, R. J., **International Symposium on Experimental Meteorology, Zurich, Octob 4–6, 1954.** *Meteorological Magazine*, 83(990):374–375, Dec. **1954. DWB**—This volume contai the opening address and 14 of the 18 papers presented at an international symposium in Zuric The papers are substantial contributions to the fields of the physics of clouds and precipitatio condensation nuclei and weather modification. Those having a direct bearing on the last mentione subject are being abstracted separately in the present bibliography (*see items* 6J–297, 6J–302, 6J–32 6J–322 and 6J–331). Others have been included in our bibliography on **Condensation Nucl** (Sept. 1955, *MAB*). In MURGATROYD's review the lectures are briefly summarized. *Subje Heading:* **1. Artificial precipitation symposia.**—*G.T.*

6J–313 551.509.

Jeeves, T. A.; LeCam, L.; Neyman, J. and Scott, E. L., **On the methodology of evaluating clou seeding operations.** California. Univ. Statistical Laboratory, April **1953.** 49 p. Also issued *California. State Water Resources Board, Bulletin*, No. 16:79–125, June **1955.** 13 figs. (fold 4 tables, 6 refs. **DWB**—The report presents (1) a critical analysis of two frequently used metho of evaluating cloud seeding operations, the method of percent of normal and the regression metho (2) brings out what appears to be a common but thus far unnoticed phenomenon, namely, that t relation between the rainfall in two adjoining areas (target and control) varies from one type storm to another, (3) a suggested modification of the regression method, (4) an analysis of t Carrizo Plain cloud seeding operations of 1950/51 and of 1951/52 by means of the modified metho of regression, and (5) an outline of an experiment capable of producing real documentary eviden of the effectiveness of cloud seeding. (*Same item as* 5.5–73, May 1954, *MAB*.) *Subject Heading* **1. Cloud seeding evaluation 2. California.**—*From authors' abstract.*

6J–314 551.509.67:676

Krick, Irving P., **The value of weather modification operation to the pulp and paper industrie** *Pulp and Paper Magazine of Canada*, 56(3):263–274, 297, Convention Number, **1955.** 15 figs 2 tables, 16 refs. **DA**—Describes the application of weather modification to benefit the pulp an paper industries through rain stimulation and lightning suppression. The author relates the nece sary steps for successful operations to increase precipitation and illustrates these with the analys of three projects operated in Canada, the U. S. and Spain. Although lightning suppression is st in an experimental stage, the author feels that operations would be successful since in an area continuous cloud seeding operations strong indications are given, as illustrated by statistics fro the U. S. Forest Service, that weather modification could reduce lightning threats. The technic and scientific progress achieved and future development are briefly outlined. *Subject Heading* **1. Cloud seeding 2. Lightning prevention.**—*Author's abstract.*

6J–315 551.509.67:

Krick, Irving P., **We can help the clouds to rain.** *Farmer & Stock-Breeder*, London, 69(3417):6 63, April 19/20, **1955.** photos, graph. **DA**—The author explains how a supply of artificial co densation nuclei will increase the fall-out of water from rain-clouds and also prevent the developme of large hailstones. Benefits accruing to agriculture from an increase in precipitation amount a discussed. *Subject Headings:* **1. Cloud seeding 2. Effects of rainfall increase.**—*G.T.*

6J–316 551.509.67

Langmuir, Irving, **A critique of the design of experiments on cloud seeding and statistical ethods for their evaluation.** (In his: **Widespread control of weather by silver iodide seeding.** *eneral Electric Research Laboratory, Schenectady, Report* No. 55-RL-1263, July **1955.** p. 125–168.) **WB**—In this report prepared for the U. S. Advisory Committee on Weather Control, the author ves a detailed account of his observations as a special consultant invited to visit the operation of the loud Physics Project of the University of Chicago at Ramey Field, Puerto Rico, Feb. 11–14, 1954. he operation involved seeding of trade-wind clouds with 410 gallons of water dumped into the ouds from airplanes in 18 sec. Meteorological conditions, cloud structures and effects of seeding e discussed. The author also makes several suggestions for improving evaluation techniques pplicable to the seeding of individual clouds from airplanes. He gives numerous examples from s experience with Project Cirrus to support his evaluation scheme. The theoretical basis of ANGMUIR's suggestions is the hypothesis (supported by evidence) that "seeding of clouds of the roper types produces fundamental changes in the frequency distribution function of the rainfall om seeded clouds. Thus, with inadequate knowledge to guide us in selecting the clouds to be eded, we should expect to get a few large positive effects and many small or even negative effects." *ubject Headings:* **1. Cloud seeding with water 2. Cloud seeding evaluation 3. Rain from non-eezing clouds. I. General Electric Research Laboratory.**—*G.T.*

6J–317 551.509.67:551.577.33

Langmuir, Irving, **Widespread control of weather by silver iodide seeding.** *General Electric esearch Laboratory, Schenectady, N. Y., Report,* No. 55-RL-1263, July **1955.** 175 p. figs., tables, gs. Appendixes A–E, p. 71–175. **DWB**—The author re-asserts his hypothesis of a large-scale ffect of cloud seeding with silver iodide and refutes the objections which have been raised against it. he considerable statistical material presented here relates to 37 consecutive 28-day cycles (Nov. 13, 949–Aug. 13, 1952). 24-hr rainfalls reported by 126 Weather Bureau stations are analyzed as to -day periodicities and compared with periodic seedings conducted on a predetermined schedule uring 23 of the 37 cycles. In 17 out of the 23 seeded cycles very high periodicities were produced ver large parts of the United States, while no comparable periodicities occurred in the 14 cycles uring which there was no seeding. Silver iodide seedings made only under favorable conditions nstead of a fixed schedule) are also considered and found to enhance the probability of high perio-icities in rainfall. Appended are:

A: **Analysis of certain 7-day periodicities in rainfall,** p. 71–76.
B: **Second revision of Chapter 12, Final Report, Project Cirrus (1953),** p. 77–113.
C.: **Relation between 7-day periodicity in silver iodide seeding and 7-day periodicity in rainfall and in temperature,** p. 115–124.
D: **A critique of the design of experiments on cloud seeding and statistical method for their evaluation,** p. 125–168. (For abstract *see item* 6J–316.)
E: **Errata for Final Report, Project Cirrus (1953).**

ubject Headings: **1. Cloud seeding with silver iodide 2. Cloud seeding evaluation 3. Large-scale ffects of cloud seeding. I. General Electric Research Laboratory.**—*G.T.*

6J–318 551.509.67

Less hail, more rain—on order? *Farm Journal,* p. 27, 87, July **1955.** diagr. **DLC**—Review f the current rain-making situation: (a) successful large-scale cloud seeding operations in Georgia, Mississippi and Oklahoma, (b) continued hail suppression operations in California and Oregon by . P. KRICK and (c) statement by H. C. THOM, chief climatologist for the Advisory Committee on Veather Control, regarding the development of statistical methods for evaluating results of cloud eeding. *Subject Headings:* **1. Weather control 2. Cloud seeding evaluation.**—*G.T.*

6J–319 551.509.67

Lincoln, Russell L., **Analysis of four years of attempts to increase precipitation by cloud seeding n Tri-County area, Oregon, 1950–1954.** *Oregon Agricultural Experiment Station, Corvallis, Miscellaneous Paper,* No. 10 [1955?] 37 p. figs., tables. **DWB**—This paper covers the evaluation f the Tri-County Cloud seeding project conducted in north central Oregon for the four consecutive easons, Sept. to June, 1950–54. A multiple regression analysis was conceived in which the pre-ipitation in the target on a short period (daily) basis was related to meteorological factors causing he rainfall. IBM cards and machine processing methods were used to determine and apply the uantitative values of the several meteorological factors used. The resulting sensitivity of this ultiple regression analysis is such that only a 15.5% increase of measured precipitation for four easons over that amount mathematically computed to have fallen naturally would be sufficient o declare with 95% confidence (19 to 1 odds) that some outside influence had produced the increase. net four season positive departure of measured from expected amount of precipitation was shown

by this analysis to be between 5 and 6%. *Subject Headings:* **1. Cloud seeding evaluation 2. Cloud seeding in Oregon 3. Punched card analysis 4. Oregon.** —*From author's abstract.*

6J–320 551.509.67:551.576.11:551.577.1

Ludlam, F. H., **Planning cloud seeding research.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(3):283–292, 1955. 3 figs. English, German and French summaries p. 283. **DWB**—In designing experiments in cloud seeding at Stockholm Institute of Meteorology attention was first concentrated on studies of natural cumulus by eye and radar from mountain stations and by aircraft. Points being studied are formation and growth, properties of cumulus populations, formation and development of showers, rate of rise of cumulus tops, and "glaciation." Examples are described. *Subject Heading:* **1. Cloud seeding research.**—*C.E.P.B.*

6J–321 551.594.14:551.515:662:539.

Machta, L. and Harris, D. L., **Effects of atomic explosions on weather.** *Science*, 121(3134):75–81, Jan. 21, 1955. 6 figs., 14 refs. **DWB**—Various suggested mechanisms by which atomic explosions might influence weather have been reviewed. They include such hypotheses that the atomic debris might serve as a cloud seeding agent, that the radioactive nature of the debris might change the electric conductivity of the free atmosphere, that the dust resulting from atomic explosion might obscure the solar radiation and that the energy of the explosion might affect significantly the weather beyond the testing location. No theoretical reason has been found for believing that the above mechanisms could alter the weather significantly more than a few miles from the explosion site. Increase of tornadoes in 1953 was a reflection of greater accuracy in tornado statistics. Temperature and precipitation anomalies fail to show any relationship to atomic explosions. (*Same item as* 6.8–342, Aug. 1955, *MAB.*) *Subject Headings:* **1. Atomic explosions 2. Radioactive fallout 3. Weather control.**—*I.L.D.*

6J–322 551.509.6

Mason, B. J., **Design and evaluation of large-scale rain-making experiments.** *Nature*, London, 175(4454):448–451, March 12, 1955. 7 refs. **DWB**—The present scientific status of rain-making experiments is discussed. Various seeding procedures are described. From methods adopted for statistical evaluation of results "one can find no convincing evidence that large increases of rainfall can be produced consistently over large areas." Physical problems include: how often are natural ice nuclei deficient?; effectiveness of AgI nuclei released from the ground; and decay of AgI nuclei. A proposed test experiment is outlined. *Subject Heading:* **1. Cloud seeding evaluation.**—*C.E.P.B.*

6J–323 551.509.6

Mason, B. J., **The modification of rainfall by large-scale cloud seeding.** *Royal Meteorological Society, Quarterly Journal*, 81(348):284–286, April 1955. fig. Summary in: *Water and Water Engineering*, London, 58(706):530–531, Dec. 1954. **DLC**—Seeding of isolated cumulus clouds has increased rainfall but the evidence that large increases can be produced consistently over large areas by release of AgI from the ground is not convincing. An experiment is suggested for testing this. *Subject Heading:* **1. Cloud seeding.**—*C.E.P.B.*

6J–324 551.509.6

The most extensive cloud-seeding experiment. *Science*, 121(3148):629, April 29, 1955. **DWB**—Large-scale effects of cloud seeding with dry ice and silver iodide were found to be non-existent although small scale effects may have occurred during 9 months of trials on the East Coast of the U.S.A., Jan.–April 1953 and Dec. 1953–April 1954. Thirty tons of dry ice were dropped from airplanes between Mass. and Florida, and 250 lbs of AgI were sprayed from ground generators. Eighteen of 37 cases selected were seeded and 19 left as controls. "Project Scud" was conducted by New York Univ. College of Engineering. *Subject Headings:* **1. Cloud seeding in Eastern U. S. 2. Large-scale effects of cloud seeding 3. Project Scud (N. Y. Univ.) 4. Atlantic Coast, U. S.** —*M.R.*

6J–325 551.509.6

O'Hanlon, Charles A.; Battle, John A.; Todd, Clement J. and Barr, Neal M., **Cloud-seeding operations in Santa Clara County, California, December 15, 1954–March 15, 1955.** Weather Modification Company, Redlands, Calif., [1955]. 42 p. figs., tables, charts. **DWB**—The experiments reported in this document were conducted in Santa Clara County, Calif., during three winter months by means of ground-based and aircraft seeding. With the help of radar (1) the effect produced by seeding in the clouds could be observed, (2) certain shortcomings were found in the generators used and better units were developed and (3) it was ascertained that aircraft generators had a tendency to oversced; this defect was eliminated by the use of a new chemical mixture. Radar scope photographs, data on ground and flight operations and comparative rainfall data (target vs

ntrol area) are presented. Each individual storm is described as to synoptic development and erational details. An average 19% increase in precipitation due to cloud seeding is claimed for e season. *Subject Headings:* **1. Radar rainfall observation 2. Cloud seeding evaluation 3. Cloud eding in California 4. Santa Clara, California. I. Weather Modification Company, Redlands, alif.**—*G.T.*

6J–326 551.509.67:551.578.7

Pastorini, F. M., **Organizzazione ed esito della lotta antigrandine in provincia di Torino nell'anno 954.** [Organization and outcome of hail control in Torino Province in 1954.] *Cronache Eco-omiche*, Torino, No. 146:25–29, Feb. **1955.** diagrs., tables. **DA**—Statistical material is presented, owing an increase in hail-control activities (1954 compared to 1953) in terms of 1) number of gional units participating, 2) number of communities, 3) launching units, 4) actual operations, rockets launched and 6) cost. Rockets containing silver iodide were used besides the conventional xplosive rockets. No direct indication is given of the results achieved. *Subject Headings:* **1. Hail revention in Italy 2. Hail shooting 3. Torino Province, Italy.**—*G.T.*

6J–327 551.509.67:551.578.7

Pizzi, Giovanni, **Consuntivo della esperimentazione antigradine 1951 in provincia di Vicenza.** Summary of hail control experiments in 1951 in Vicenza Province.] *Vicenza, Italy. Camera Commercio, Industria e Agricoltura, Notiziario Economico*, 7(1):8–9, Jan. 1, **1952.** Also his: **'esperimentazione antigrandine della provincia di Vicenza nel 1952.** [Hail control experiments in icenza Province in 1952.] *Ibid.*, 7(12):15–16, June 16, **1952.** Also his: **La difesa antigrandine in rovincia di Vicenza nel suo 5° anno di esperimenazione: primi resultati.** [Hail control in Vicenza rovince in its 5th year of experimenting; first results.] *Ibid.*, 9(10):7, May 16, **1954.** Also his: **a difesa antigrandine in provincia di Vicenza al 6° anno di esperimentazione.** [Hail control in icenza Province in its 6th year of experimenting.] *Ibid.*, 10(8):1–2, April 16, **1955.** photo. **A**—These reports cover the administrative and financial aspects of hail control activities in Vicenza rovince. In 1951 an area of 20,500 ha was protected by 249 launching stations. In 1954 an area over 34,000 ha was protected by 420 launching stations. The first qualitative results of the 5th ear of operation (May 3, 4, 1954) were found satisfactory by visual observation. At the beginning the 6th year of operation the protected area is 35,000 ha, with 438 launching sites. The cost nce 1950 varied between 218 and 634 lire per ha and season. The rockets act by explosion between 00 and 1500 m. The author maintains that this mechanical method provides effective protection om hailstorms, especially those connected with local thunderstorms. A photograph showing rocket shortly after take-off is presented. *Subject Headings:* **1. Hail prevention in Italy 2. Hail ooting 3. Vicenza Province, Italy.**—*G.T.*

6J–328 551.509.67

Rain-making experiments in Australia. *Australian Sugar Journal*, Brisbane, 46(11):741–747, eb. 15, **1955.** photos. **DLC**—Describes various cloud seeding methods. In Australia dry-ice eding was definitely successful; AgI seeded from the air was found to require colder cloud-top mperatures for success; a ground-generator experiment carried out over a period of 3 months was conclusive; seeding with water produced rain from nonfreezing clouds at least 5000 ft thick. As ie techniques which showed success in Australia require the use of aircraft, their cost is prohibitive. ome less expensive methods will have to be developed. *Subject Headings:* **1. Cloud seeding in ustralia 2. Cloud seeding techniques 3. Australia.**—*G.T.*

6J–329 551.609.67

Rainmaking powers limited. *Engineering News Record*, New York, 154(18):100, May 5, **1955. LC**—Findings of two reports on weather modification research are briefly summed up: 1) New York niversity reports on the basis of two years of research that storms cannot be controlled on a large ale. 2) According to the California State Division of Water Resources, cloud seeding sometimes creases, sometimes does not affect and sometimes decreases precipitation from storms, depending physical conditions not yet under control. *Subject Headings:* **1. Cloud seeding evaluation Weather control.**—*G.T.*

6J–330 551.509.67

Rain making succeeds in tropical clouds. *Science News Letter*, 67(23):367, June 4, **1955. LC**—Reports statement by Horace R. Byers on successful seeding of nonfreezing clouds with ater spray. Experiments sponsored by the U. S. Air Force were conducted over the open sea ear Puerto Rico and controlled by radar. Statistically significant positive results were obtained. *ubject Headings:* **1. Cloud seeding evaluation 2. Cloud seeding with water. I. Byers, Horace R.** -*G.T.*

6J–331 551.574.1:551.509.67(08

Sänger, R., **International Symposium on Experimental Meteorology, Zürich 4. bis 6. Oktobe 1954. Opening address.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(3) 145–146, 1955. **DWB**—A test in Switzerland showed that rockets were completely ineffective fo inhibiting hail. A symposium on artificial influencing of weather processes was organized and th papers presented are given in this volume. *Subject Headings:* **1. Hail prevention in Switzerlan 2. Cloud seeding research 3. Hail shooting 4. Symposia.**—*C.E.P.B.*

6J–332 551.501:551.509.6:632.18

Schaefer, Vincent J., **Jet streams, thunderstorms and Project Skyfire.** *Archiv für Meteorologi Geophysik und Bioklimatologie, Ser. A*, 8(3):265–282, 1955. 7 figs., 14 refs. English, German an French summaries p. 265. **DWB**—Project Skyfire aims at discovering new facts about thunde storms and jet streams, especially in connection with forest fires, more than 70% of which are cause by lightning. The cloud survey from 25 mountain summits in Idaho and Montana is describe Besides thunderstorms, the relations of high clouds to the presence of a jet stream, the velocities high clouds, and the height of cumulus bases were studied. The 1953 program was exploratory In 1954 a mobile weather observatory was introduced. The possibility of cloud seeding to preve or modify thunderstorms is discussed. *Subject Headings:* **1. Jet stream clouds 2. Thundercloud 3. Forest fire control.**—*C.E.P.B.*

6J–333 551.509.6

Shope, Harlan D., **Progress report on "Producing rain by cloud seeding."** *Paper Trade Journa* N. Y., 139(27):23, July 4, **1955. DLC**—Reports on cloud seeding operations in various areas of th southern U. S. by Howell Associates under contract with International Paper Co. Qualitativ results of the operations are indicated. *Subject Heading:* **1. Cloud seeding in Southern Unite States.**—*G.T.*

6J–334 551.509.6

Sigmund, H., **Über die Möglichkeit und den Wert der künstlichen Auslösung von Niede schlägen.** [Possibility and value of artificial production of rain.] *Wetter und Leben*, Vienn 7(1/2):1–12, **1955.** 2 figs., 4 tables, 6 refs. **DWB**—After summarizing the 1954 WMO report o "artificial inducement of precipitation," the author analyzes the agricultural value of artificiall induced rainfall on the basis of the drought period prevailing in Vienna in April 1952, July 19 and April to Oct. 1947. It is assumed that cloud seeding could increase the daily rainfall by 1 mm The synoptic conditions during the drought period and the advantages of cloud seeding durin each are analyzed. *Subject Heading:* **1. Artificial precipitation.**—*I.L.D.*

6J–335 551.509.6

Spar, Jerome (*Dept. of Met., N. Y. Univ.*), **Weather control experiment in the Eastern Unite States.** *New York Academy of Sciences, Transactions*, Ser. 2, 17(8):621–626, June **1955.** tabl **DLC**—Scientific results achieved under Project SCUD (New York Univ.) are reported. Th purpose of the project was "to determine the effects of artificial cloud nucleation on cyclogenes off the east coast of the U. S." During the periods Jan.–April 1953 and Dec. 1953–April 19 extensive cloud seeding operations were carried out both from the air (dry ice) and from the groun (AgI). A careful statistical analysis of precipitation and pressure data does not show any effe exceeding natural meteorological variance. *Subject Headings:* **1. Cloud seeding in Eastern U. 2. Project SCUD (New York Univ.).**—*G.T.*

6J–336 551.574.1:551.509.6

Stimson, Thomas E., Jr., **Let's import rain for the Dust Bowl.** *Popular Mechanics Magazin* 103(1):119–123, 234, 236, Jan. **1955.** figs., photos. **DLC**—Cloud physics studies conducted at th New Mexico Institute of Mining and Technology under J. WORKMAN are discussed. The "clou tube" used for simulating various cloud conditions is described and illustrated. Particular attentio is paid to the discovery of the generation of thunderstorm electricity by phase transitions of clou droplets, and a possible modification of this process by seeding with ammonia. The idea of a lon range effect of cloud seeding operations is also discussed. *Subject Headings:* **1. Cloud physics researc 2. Thunderstorm electricity generation 3. Cloud seeding with ammonia.**—*G.T.*

6J–337 551.509

Suggest reverse of cloud seeding method. *Science News Letter*, Wash., D. C., 67(20):31 May 14, **1955. DLC**—Rainfall may be increased by removing particles from the air in order t prevent natural overseeding. This was suggested, according to this brief note, by GLENN W. BRIE of the U. S. Weather Bureau to the International Arid Lands Meetings in Albuquerque, N. M *Subject Headings:* **1. Artificial precipitation 2. Brier, Glenn W.**—*G.T.*

6J–338 551.509.67:551.578.7

*Switzerland. Eidg. Kommission zum Studium der Hagelbildung und der Hagelabwehr, **rossversuch II zur Bekämpfung des Hagels auf der Magadinoebene. 1. Versuchsjahr.** [Project for Hail Control in the Magadino Plain. 1st year of experimenting.] Its *Tätigkeitsbericht*, No. 6, 953, pub. by Eidg. Volkswirtschaftsdepartement. Abteilung für Landwirtschaft, Bern, **1954.** 5 p. 19 figs., 40 tables. Also: . . . **2. Versuchsjahr.** . . . [2nd year of experimenting.] Its *ätigkeitsbericht*, No. 7, 1954. publ. **1955.** 41 p. 12 figs., 41 tables. **DWB**—Progress Report o. 6 is the first on the new hail control project in the Magadino Plain, in which rockets were replaced y ground-based AgI generators. A very comprehensive description of the seeding network and each operation is given, with detailed data and charts. Despite the painstaking observation and valuation efforts no definite conclusions could be reached, due to the small number of thunderorms during the summer of 1953. Progress Report No. 7 gives an equally detailed description the 1954 operations and their results, which are again termed inconclusive because of the paucity hailstorm cases. In the second year automatic generators were used instead of hand-operated nits; thus the operation time could be prolonged. As a side study the project comprised tracing AgI particles in rain water from seeded storms and electron-microscope study of such particles. he project is to be continued. *Subject Headings:* **1. Hail prevention in Switzerland 2. Cloud eeding with silver iodide 3. Magadino Plain, Switzerland.**—*G.T.*

6J–339 551.509.67

Todd, Clement J. (*Project meteorologist*) and Battle, John A. (*Vice pres.*), **Cloud-seeding operaons in the Santa Ana River watershed for the period November 1, 1954 to April 15, 1955.** Redands, Calif., Weather Modification Company, [**1955**]. 34 p. photos., maps. **DWB**—In this eport over a dozen seeded storms are described and shown on maps representing synoptic develoent, generators operated and rainfall areas. The effect of seeding was observed by radar (radarcope photographs presented) which made detailed observation of rainfall areas possible. It was ound that many areas were left unaffected, which leads to the conclusion that a larger number of enerators of a new type should be used. From the data available it is estimated that an average 0% precipitation increase was achieved in these operations. *Subject Headings:* **1. Cloud seeding in alifornia 2. Cloud seeding evaluation 3. Radar analysis of rain 4. Santa Ana river, Calif. Weather Modification Company, Redlands, Calif.**—*G.T.*

6J–340 551.5:63:016 551.509.67:016

†U. S. Dept. of Agriculture. Library, **Bibliography of Agriculture.** v. 1, No. 1, Jan. 1942. atest issue seen Vol. 19, No. 10, Oct. **1955.** Monthly. Price: $8 in U. S.; $9.50 foreign, from ovt. Print. Off., Washington, D. C. **DA, DLC**—In this accession list of the Dept. of Agriculture ibrary, articles appearing in the journals received by the Library are listed in a subject arrangement. apers on weather modification (at the rate of up to fifty or more a year) are gathered together oward the end of each monthly issue under the heading "Miscellaneous" (subheading "Meteorlogy"). Most of the material is popular or semi-popular papers appearing in American or foreign gricultural journals. For information on the history and results of cloud seeding operations, on ail shooting in Italy, France and elsewhere, and other similar topics the **Bibliography of Agriculture** ill be found a useful source of reference. Call numbers lead directly to the pieces on the Library's elves. In the annual subject index papers on weather modification are brought together under "Precipitation (artificial)" and "Hail control." (*Same item as* 6A–34, Jan. 1955, *MAB.*) *Subject eadings:* **1. Agricultural meteorology bibliographies 2. Weather modification bibliographies.** –*G.T.*

6J–341 551.509.67:016

†U. S. Weather Bureau, **A short bibliography on artificial production of precipitation.** Its ..*S.*5507, Revised Aug. 1, **1955.** 8 p. **DWB**—A careful and competent selection of literature on loud seeding. The bibliography is entirely up to date and covers papers written in English, most f them published since 1949. The references (author, title, source) are given in the following subject rrangement: A. Fundamental papers (4 items), B. Historical (5), C. Legal aspects (6), D. U. S. Government experiments and evaluations (7), E. Other experiments and evaluations (31) and . Theoretical discussions (29). *Subject Heading:* **1. Weather modification bibliographies.**—*G.T.*

6J–342 551.509.67

Verna, Antonio, **Pioggie artificiali: raccolto assicurato; . . . fino a quando?** [Artificial rain: rop assured—until when?] *Selezione di Tecnica Molitoria* (*Pastificazione, Panificazione*), Pinerolo, (3):41–42, March **1955. DA**—Warns of dangers of indiscriminate cloud seeding which would pset the natural balance of weather development and (in Langmuir's words) "could lead to climatic isasters capable of transforming the entire globe into an immense desert." *Subject Heading:* **. Artificial precipitation.**—*G.T.*

6J–343 551.509.67

Vernon, Edward M. (*U. S. W. B., San Francisco Airport*), **Report on classification of storms for statistical evaluation with special reference to Carrizo plain and Santa Maria coastal areas.** Feb., May and Oct. **1953.** *California. State Water Resources Board, Bulletin*, No. 16 (Append. F) 163–193, June **1955.** figs. (fold.), table, 10 refs. Addenda, p. 185–193. **DWB**—This report contains an outline of a method of precipitation classification by pressure and flow pattern types. The types are selected according to their favoring precipitation amounts in one (target) or the other (control) area considered. The method is worked out for various regions in California, with applicability to the evaluation of cloud seeding operations there. (For fuller abstract, *see* 6.6–140, June 1955, *MAB.*) *Subject Headings:* **1. Precipitation classification 2. Synoptic classification of precipitation 3. Cloud seeding evaluation 4. California.**—*G.T.*

6J–344 551.509.6

von Neumann, John (*member, Atomic Energy Commission*), **Can we survive technology?** *Fortune*, N. Y., 51(6):106–108, 151–152, June **1955.** port. **DLC**—In an article on technological developments by 1980, among other things, the author discusses the possibility of large scale weather control becoming effective during the next 25 years. If such control is attained for peaceful purposes, it may also be used for offensive purposes—such is the history of all new technological developments. Rain making, changing the amount of effective incoming solar radiation by changing the delicate balance of chemical elements in upper atmosphere (CO_2, O_3 for instance), or by changing albedo of snow or glacier surfaces, etc. are examples of types of climate control possible in the next generation. *Subject Headings:* **1. Weather control 2. Technological advances.**—*M.R.*

6J–345 551.509.67

Woodbridge, David D. (*Dept. of Physics, Oregon State College, Corvalis*), **A storm analysis of the Tillamook Burn cloud-seeding operation.** *American Meteorological Society, Bulletin*, 36(1):22–26, Jan. **1955.** 3 figs., 3 tables, 7 refs. **MH-BH**—The method of storm analysis used to evaluate cloud seeding operations consists of the typing of frontal systems for all of Oregon on the basis of pressure distribution over Oregon and the Pacific "as a front enters a so-called critical area." For each type a definite percentage of "dry frontal passages" was found and from these values the probabilities for the occurrence of precipitation with each type of frontal passage are calculated. "Prevailing type storms were compared with similar storm types that passed through the Tillamook Burn area during the cloud seeding operation." *Subject Headings:* **1. Cloud seeding in Oregon 2. Oregon.**—*I.L.D.*

6J–346 551.509.67:016

†Krick, Irving P. (*comp.*), **A bibliography on weather modification and field operations, using the combined facilities of Irving P. Krick, American Institute of Aerological Research [and] Water Resources Development Corporation.** Denver, Colorado, American Institute of Aerological Research, Aug. 31, **1955.** unpaged. Mimeo. **DWB**—A list of some 200 lectures or reports prepared from 1947 to 1955 and including the 104 items listed in an earlier bibliography (*see item* 6J–177) and reprinted in *Meteorological Abstracts and Bibliography*, 4(8):963–968, Aug. **1953.** The period covered by those 104 items was 1947–Feb. 1953. The bulk of reports published during the period March 1953–Aug. 1955 is given below. The letters following the report numbers refer to the authors, i.e., I. P. Krick (K), American Institute of Aerological Research (A) and Water Resources Development Corporation (W). The numbers in parentheses are being supplied by us for indexing purposes.

(1) 142-W **Final Operating Report for S.E. Arizona Weather Research Assn. 1952 Excluding May and June.** March 16, **1953.**
(2) 143-W **Final Operating Report, Oct.–Dec. 1952.** For: West Texas Weather Improvement District. March 18, **1953.**
(3) 102-W **Operational Report April–Sept. 1951.** (WY-1). For: Powder River Weather Research Corp. March 25, **1953.**
(4) 119-W **Snowpack Operation, Utah, 1952–53.** For: Richfield, Utah Meeting, April 27, **1953.**
(5) 120-W **Precipitation values in Utah, April 1950 to March 1951, April 1952 to March 1953.** For- Utah County Commissioners. April **1953.**
(6) 145-A **Final Operating Report, Nov. 8, 1952 to March 8, 1953.** For: Platte Valley Water Users Association and Northern Colorado Natural Resources Association. April 8, **1953.**
(7) 98-A **Survey to determine the feasibility of cloud seeding operations in Morocco.** For: Energie Électrique du Maroc. April 10, **1953.**
(8) 147-W **Operations Report, Nov. 22, 1952–May 22, 1953.** For: City of Dallas, Texas. June 9, **1953.**
(9) 148-A **Operations Report, Sept. 1952–March 1953.** For: Pacific Power & Light Co. June 16, **1953.**

0) 149-A **Operations Report, Nov. 1952–March 1953.** For: British Columbia Electric Co., Ltd. June 16, 1953.
1) 150-A **Operations Report, Jan. 1, 1953–April 10, 1953.** For: Northwest Colorado Weather Improvement Corp. June 22, 1953.
2) 144-W **Final Operating Report, Oct. 1952–March 1953.** For: T-O Moisture Improvement Association. July 22, 1953.
3) 170-A **Operations Report, Oct. 1952–April 1953.** For: Panhandle Weather Improvement Association (OTK-1). Aug. 1953.
4) 172-A **Operations Report—April 1, 1953–May 19, 1953.** For: North Central Weather Modification Corp. (Ref.: ND-4.) Aug. 1953.
5) 182-A **Operations Report for Morocco.** For: Energie Électrique du Maroc. Aug. 1953.
6) 168-A **Operations Report 1951–1952–1953.** For: Western S. Dak. Rain Increasing Corp. and West Central S. Dak. Weather Impr. Ass'n. Aug. 20, 1953.
7) 173-A **Operations Report May–July 1953.** MT-1 (*Manitoba*). For: WRDC Modification Corp., Ltd. Sept. 1953.
8) 174-A **Operations Report April 15–July 15, 1953.** For: North Central S. Dakota Rain Increase Corp. (Ref.: SD-4.) Sept. 1953.
9) 176-A **Operations Report May–Sept. 1953.** For: Platte County Rain Increasing Ass'n. (Ref.: WY-6.) Sept. 1953.
0) 179-A **Operations Report June 1952–May 1953.** For: Southern Utah Water Resources Development Corp. (Ref.: U-1.) Sept. 1953.
1) 183-A **Operations Report March 27–June 15, 1953.** For: Box Elder Farms Co. (Ref.: C-9.) Sept. 1953.
2) 184-A **Operations Report 1950–1953.** For: Horse Heaven Water Development Corp. (W-1) Big Bend Wt. Dev. Corp. (W-2) Blue Mountain Weather Research Ass'n (O-4) (Umatilla County). Sept. 1953.
3) 186-A **Operations Report Jan. 1, 1953–Sept. 30, 1953.** For: East Texas Weather Improvement District (T-7). Dec. 1, 1953.
4) 185-A **Cloud seeding in Israel (Preliminary Report). The Storm Nov. 17–22, 1953.** Dec. 1, 1953.
5) 187-W **Increasing Water Resources in Spain. Summary Report (Preliminary) The Rio Alberche Operation.** For: Union Electrica Madrilena, **Oct. 1952–Sept. 1953.** Dec. 30, 1953.
6) 175-A **Operations Report April 15–Oct. 31, 1953.** SD-5 Hyde, Buffalo, Jerauld, Beadle, Aurora & Hand Counties. Jan. 1954.
7) 189-A **Operations Report Oct. 14, 1952–Oct. 15, 1953.** For: Comanche County, Kansas; Woodward County, Okla.; Harper County, Okla. (Ref.: OK-3.) Jan. 1954.
8) 192-A **Operations Report—Weather Modification Project, Nov. 1953.** Israel. Jan. 1954.
9) 188-A **Report on Hail Suppression Experiment conducted for Washington and Logan Counties, Colorado—July 2–Aug. 12, 1951.** Jan. 8, 1954.
0) 190-W **Report on weather modification operations to increase precipitation in Spain Oct. 1, 1952–Sept. 30, 1953.** For: The Ministries of Air & Agriculture, Madrid, Spain. Feb. 1954.
1) 195-W **Typical cloud-seeding operations 1948–1953 (Seeding manual).** Feb. 1954.
2) 198-W **Report of weather modification operations to increase precipitation in Spain. Summary of Ppt. over Iberian Peninsula Oct. 1952–Dec. 1953.** For: The Ministries of Agriculture & Air, Madrid, Spain. March 1954.
3) 191-W **Report on weather modifications operations to increase streamflow in the Alberche River, Oct. 1, 1952–Sept. 30, 1953.** For: Union Electrica Madrillena, Madrid, Spain. April 1954.
4) 200-W **Lightning suppression; Aid to forest fire control.** April 1954.
5) 209-A **Cloud seeding potentialities on the island of Grande Terre in the French West indies.** To Syndicate of Producers-Exporters of Sugar and Rum of the Guadeloupe and Dependencies. June 30, 1954.
6) 211-A **Operations Report. December 26, 1953–May 2, 1954.** (Ref.: C-8.) For Platte Valley Water Resources Association. July 15, 1954.
7) 212-A **Operations Report. Feb. 12, 1954–April 23, 1954.** (Ref.: WY-7.) For: Wyoming Weather Inc. July 15, 1954.
8) 215-A **Operations Report Nov. 1, 1953–May 11, 1954.** (Ref.: OC-1.) For: The City of Oklahoma City. July 27, 1954.
9) 217-W **Weather modification operations to increase streamflow in the Alberche River, Spain. 15 months' precipitation summary Oct. 1952–Dec. 1953.** For: Union Electrica Madrilena, Madrid, Spain. July 1954.
0) 214-A **Operations report May 15, 1953–May 14, 1954.** (Ref.: U-1.) For: Southern Utah Water Resources Development Corp. Aug. 1954.

(41) 216-A **Cloud seeding review 1950-1954.** For: Horse Heaven Water Development Corp. (Ref.: W-1) Big Bend Water Development Corp. (Ref.: W-2) Blue Mountain Weather Research Assoc. (Ref.: O-4). Aug. 1954.

(42) 218-A **Review of sustained cloud seeding operations in Utah, New Mexico, Pacific Northwest, Colorado Rockies and Spain.** Aug. 11, 1954.

(43) 220-A **Water Resources Development Corporation cloud seeding review 1951–1954.** For: SD-1, 2, 3, 4, 5. Sept. 1954.

(44) 223-A **Interim Report on Israel Weather Modification Project.** Sept. 1954.

(45) 222-A-K-W **Hail suppression theory and practice.** Oct. 1954.

(46) 219-W **Operaciónes de modificación meteorológica destinadas a incrementar la precipitación en España. Examen de la precipitación recibida durante el periodo de 18 meses Octubre de 1952 a Marzo de 1954.** [Weather modification operations to increase precipitation in Spain. Analysis of rainfall for the 18-month period Oct. 1952–March 1954.] Madrid, Aug. 1954.

(47) 224-A **Report on Hail Suppression Project, March 31—June 21, 1954.** (Ref.: CA-2.) For: Placer County Farm Labor Co-Operative, Calif. Sept. 1954. [For Supplement, *see* (60) below.]

(48) 225-A **Report on cloud seeding operations July 1953–July 1954.** For: West Texas Utilities Co. (Ref.: T-11 and T-12.) Oct. 1954.

(49) 226-A **Report on cloud seeding operations May 21, 1954–July 28, 1954.** (Ref.: ND-4.) For: North Central Weather Modification Corp. Oct. 1954.

(50) 227-A **Review of cloud seeding operations Oct. 1953–March 1954.** (Ref.: BC-2.) For: Powell River Co., Ltd. Oct. 1954.

(51) 231-A **Review of cloud seeding operations Aug. 26–Sept. 30, 1954.** (Ref.: SD-6.) For: Custer County, South Dakota. Nov. 1954.

(52) 228-A **Review of cloud seeding operations May–July 1954.** (Ref.: SK-1 & SK-2.) For: Weather Modification Cooperative, Ltd. and River Bend Modification, Ltd. Nov. 1954.

(53) 229-A **Review of cloud seeding operations May 1–Aug. 14, 1954.** (Ref.: MT-1.) For: Weather Modification Ltd. Nov. 1954.

(54) 230-A **Review of cloud seeding operations April 18–Sept. 6,1954.** (Ref.: WY–8.) For: Laramie County Weather Inc.; Goshen County Weather Resarch Ass'n; Niobrara County Weather Ass'n. Nov. 1954.

(55) 213-A **Review of cloud seeding operations Sept. 1, 1953–April 30, 1954.** (Ref.: W–2.) For: Pacific Power & Light Co. Dec. 1954.

(56) 236-W **A study to determine the feasibility and value of cloud seeding operations in the Lebanon.** Dec. 1954.

(57) 238-A **Hail Suppression Project Report, April 1–Oct. 15, 1954.** (Ref.: O-5.) For: Rogue River Valley Traffic Ass'n. Jan. 1955.

(58) 232-A **Operations Report Oct. 1953–Oct. 1954.** (Ref.: T-10.) For: City of Dallas, Texas. Jan. 1955.

(59) 233-A **Operations Report Oct. 1953–Oct. 1954.** (Ref.: K-2.) For: City of El Dorado, Kansas. Jan. 1955.

(60) 237-A **Hail Suppression Project March 31–June 21, 1954.** (Ref.: CA-2.) Supplement to Report No. 224. For: Placer County Farm Labor Cooperative, Calif. Jan. 1955.

(61) 243-A **Operations Report, Oct. 11–Dec. 11, 1954.** (Ref.: NC-1.) For: The City of Greensboro, North Carolina. March 1955.

(62) 252-A **Increasing streamflow and power production through weather modification operations.** For: Southern Services, Inc., Birmingham 2, Alabama. April 1955.

(63) 251-K **The application of weather modification techniques to forestry problems.** Paper prepared for delivery before the Annual Meeting, Gulf Stream Section, Soc. of American Foresters, Biloxi, Miss. May 26–27, 1955. April 1955.

(64) 249-A **The potential of weather modification operations to the banana groves of the French Cameroon.** For: La Compagnie des Bananes. April 1955.

(65) 261-A **The contribution of cloud seeding to arid land economy.** By: I. P. Krick & E. M. Frisby. Paper prepared for presentation before the AAAS Southwest Section at their Annual Meeting in Santa Fe, April 24–26, 1955. April 1955.

(66) 257-A **Operations Report Feb. 1, 1954–Jan. 31, 1955.** (Ref.: MO-1.) For: Springfield City Water Co., Springfield, Missouri. April 1955.

(67) 263-A **Survey to determine the feasibility of weather modification operations for the Lake Chapala and River Lerma watersheds.** For: The Committee of Conservation for Lake Chapala, Guadalajara, Jalisco, Mexico. May 1955.

(68) 268-K **Visible evidence of economic benefits from 4 years of cloud seeding activities over Southern Utah.** Paper read by Boyd E. Quate at 138th National American Meteorological Society Meeting in conjunction with 36th Pacific Division American Association fo the Advancement of Science Meeting. June 21–23, 1955, Pasadena, Calif. June 1955.

69) 247-A **Report of cloud seeding operations for Lake Lytle—May and June 1955.** (Ref.: T-14.) June **1955.**

70) 267-A **Operations Report Dec. 1, 1954–June 1, 1955.** Ref.: NV-2 Dec. 1, 1954–June 1, 1955. NV-3 Jan. 1–June 1, 1955. For Nevada State Cloud Seeding Committee. June **1955.**

71) 269-A **Operations Report 1950–1955.** Refs.: W-1, W-2, O-4. For: Horse Heaven Water Development Corp. (W-1), Big Bend Water Dev. Corp. (W-2) and Mountain Weather Research Ass'n (O-4). June **1955.**

72) 271-A **Visible evidence of economic benefits from four years of cloud seeding activities over southern Utah.** Paper prepared for presentation before the Amer. Met. Soc., Pasadena, June 21–23, 1955, Calif. Inst. of Tech. Meeting. June **1955.**

73) 273-K **A new source of underground water.** Paper presented to the Vertical Turbine Pump Ass'n, Dearborn, Mich., June 14, 1955. June **1955.**

74) 265-A **Report on weather modification operations in the Haut Katanga** (Belg. Congo) Jan.–April 1955. For: Union Miniere du Haut Katanga. July **1955.**

75) 275-A **Operations Report—Weather Modification Project, May 15, 1954–May 15, 1955.** For: Southern Utah Water Resources Development Corp. (Ref.: U-1.) Aug. **1955.**

76) 276-A **Operations Report—Weather Modification Project, May 15, 1954–May 14, 1955.** For: San Juan Weather Improvement Association. (Ref.: C-11.) Aug. **1955.**

77) 241 **Report on Tignes generator locations (Weather Modification Project).** For: Électricite de France. To be published in near future.

Subject Headings: **1. Cloud seeding in U.S.A. 2. Cloud seeding in Spain 3. Cloud seeding in Canada 4. Cloud seeding in Africa 5. Cloud seeding in France 6. Artificial precipitation 7. Weather modification bibliographies. I. American Institute of Aerological Research II. Water Resources Development Corporation.**—*G.T.*

6J–347 551.509.67

[Unannotated list of supplementary references on cloud seeding. 1949–1954.]—This listing comprises material which could not be included in this Bibliography with full annotation and classification. Some of these items have been abstracted previously and will be referred to by MAB index numbers (For example: MAB 3.1–63 = Item 3.1–63, Jan. 1952, Meteorological Abstracts and Bibliography). Many of the items listed here may be found in the U. S. Department of Agriculture Library, Washington, D. C. They are provided with the library symbol DA, along with that library's call number.

1949

(1) Banerji, S. K., **Suggested procedure for inducing precipitation from clouds.** [*India.*] *Central Board of Irrigation, Journal,* 6(2):175–176, April **1949. DA:** 55.9In222C

(2) Basauri, D., **La lluvia artificial en Centro America.** [Artificial precipitation in Central America.] *Café de El Salvador,* 19(216):1357–1360, April **1949. DA:** 68.28C112 Also in: *Café de Nicaragua,* 5(56/57):11–15, July/Aug. **1949. DA:** 68.28C114

(3) Contreras Arias, Alfonso, **La verdad respecto de la "lluvia artificial."** [The truth about artificial precipitation.] *Tierra;* Mexico City, 4:420–423, 490–493, July, Aug. **1949. DA:** 8T445 Also in: *Chapingo,* Mexico City, 3(28, 29):212–215, 240–244, April, May **1949. DA:** 102C36

1950

(4) Abrioux, —, **Nuages et pluie artificiels.** [Artificial clouds and rain.] *Casablanca. Chambre d'Agriculture, Bulletin,* 21(236):17–21, Dec. **1950. DA:** 24C26

(5) Angell, G. N., **Rain making; hot Wheat League topic.** *Oregon Farmer,* 73:892, 899, Dec. 21, **1950. DA:** 6 Or32

(6) Avery, B., **Rain making in Arizona.** *Reclamation Era,* 36(5):89–90, May **1950. DA:** 156.84R24

(7) Barla, M., **Esperimenti di pioggia artificiale.** [Experiments in artificial rainfall.] *Cronache Economiche,* Torino, No. 83:17–18, June 15, **1950. DA:** 280.8C882

(8) Barnes, C. S., **Precipitation control.** *Arizona Cattlelog,* 5(12):60–61, Aug. **1950. DA:** 43.8Ar42

(9) Bona, T., **Lotta antigrandine.** [Hail control.] *Il Seme,* 3(7, 8):161–164, 175–176, July, Aug. **1951. DA:** 16Se5

(10) Bossolasco, Mario, **L'ignoranza della meteorologia come mezzo di difesa utopistica contro la grandine.** [Ignorance in meteorology as a means of utopistic hail control.] *Notiziario Sulle Malattie delle Piante,* No. 9:32–33, March/April **1950.** Also: Rui, Dino, **L'ignoranza dei fatti come probabile modo per spiegare una nota.** [Ignorance of the facts as a likely explanation for a note.] *Ibid.,* p. 33–36. Reply by both authors, p. 57. **DA:** 464.8N84

(11) Burgos, J. J. and De Fina, A. L., **La lluvia artificial.** [Artificial rain.] *Tegucigalpa, Honduras. Camera de Comercio e Industrias, Boletín*, 4(42):15–19, May **1950. DA:** 287T23. Also in: *Rosario, Argentina. Bolsa de Comercio, Revista*, 38(932):3–4, 6, 8–9, Nov. 15, **1950. DA:** 6M764

(12) Dessens, Henri, **Recherches sur la pluie artificielle à l'Observatoire du Puy-de-Dôme.** [Research on artificial rain at the Puy-de-Dome Observatory.] *Annales de Géophysique*, 6(4): 331–344, Oct./Dec. **1950. MH-BH**—*see* MAB 3.1–63

(13) Fleming, Roscoe, **Making rain "seeding" clouds can produce extra KWH at low cost.** *Public Power*, Wash., D. C., 8(10):15–17, 3, Oct. **1950. DA:** 335.8P96

(14) Frostenson, P. D., **Kan man göra regn?** [Is it possible to make rain?] *Lantmannen*, Stockholm, 34(51):993–994, Dec. 23, **1950. DA:** 11L234

(15) Howell, Wallace E., **More rain for New-Yorkers?** *Weatherwise*, 3(2):27–29, April **1950. MH-BH**—*See* MAB 10–46

(16) Israel. Rainfall Research Committee, **A preliminary report on experiments for the production of artificial rain in Israel.** Hakirya, **1950.** 3 p. **MH-BH**—*see* MAB 2.4–40

(17) Jurwitz, L. R., **Rainmaking.** *Arizona Cattlelog*, 5(11):38, July **1950. DA:** 43.8Ar42

(18) Korczyn, Julius and Clark, D. D., **Dissipation of fog.** *Weather*, 5(5):185–186, May **1950. DWB**—*see* MAB 6–28

(19) Krick, Irving P., **Thorough advance research and planning imperative for successful rainmaking.—How a scientist can increase rain through proper use of silver iodide.—Why rainmaking in one region doesn't materially decrease moisture in others.** *New Mexico Stockman*, 15(7):47, (8):32–33, (9):46, July, Aug., Sept. **1950. DA:** 49N462

(20) Pauthenier, M., **Electrical coalescence of fog and clouds.** [In: Royal Meteorological Society, **Centenary Proceedings 1950.** p. 60–61.] **MH-BH**—*see* MAB 2.4–37

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SUPPLEMENTARY MATERIAL

6J–348 551.509.67

Komise pro studium umělého deště. [Research Committee on Artificial Rainfall.] *Meteorologické Zprávy*, Prague, 1(6):152, **1947**; 2(2):52, **1948**. **DLC**—Brief accounts of the first to fifth meetings (Jan. 8 to May 20, 1948) of the Czechoslovak Committee for cloud seeding research consisting of 15 members headed by M. Končeк. Subcommittees were formed for laboratory studies, aerological research, field experiments and literature survey. Tests with two different (unidentified) powders were carried out on May 14 with negative result. *Subject Headings:* **1. Cloud seeding in Czechoslovakia 2. Czechoslovakia.**—*G.T.*

6J–349 551.509.67

Koldovský, Milan, **Umělé uvolňování srážek.** [Artificial release of precipitation.] *Meteorologické Zprávy*, Prague, 3(6):94–96, **1949**. 3 refs. **DLC**—The Bergeron-Findeisen theory of precipitation formation and Langmuir's chain reaction theory of artificial nucleation are reviewed. Relative suitability of various cloud types for artificial precipitation is discussed. The author concludes that cloud seeding, in order to be effective, must be extensive and persistent, and will therefore probably be found uneconomical and impractical. *Subject Heading:* **1. Cloud seeding.**—*G.T.*

6J–350 551.509.67

Poznámka k problému umělého deště. [Note on the problem of artificial rain.] *Meteorologické Zprávy*, Prague, 4(1/2):53–54, **1950**. **DLC**—In the weekly, *Svět Práce*, No. 12, March 23, **1950**, Jan Dubský published an article under the title **Útok proti obloze.** [Attack on the sky], in which he included an enthusiastic report on a cloud seeding generator developed by the Czechoslovak Meteorological Institute, which would soon produce desired amounts of rain. The present note corrects the above statement to the effect that the instrument has not yet been completed, it will take some time to produce it, and results which can be achieved with it are unknown. *Subject Headings:* **1. Silver iodide smoke generators 2. Cloud seeding in Czechoslovakia 3. Czechoslovakia. I. Dubský, Jan.**—*G.T.*

6J–351 551.509.67

Flohn, H., **Lassen sich die Wolken impfen?** [Can clouds be seeded?] *Übersicht*, Hannover, 4(5):442–444, May **1953**. **DA**—In a concise presentation of natural and artificial precipitation processes, the author shows that significant amounts of rain cannot be produced unless natural conditions (which cannot be modified) favor such precipitation. Claims of 7-day weather periodicities resulting from seeding are rejected; legal aspects are discussed; the battle: U. S. scientists vs. commercial interests is touched upon. *Subject Headings:* **1. Artificial precipitation 2. Legal aspects of weather control.**—*G.T.*

6J–352 551.509.67:6

Howell, Wallace E., Associates, Inc. (*Cambridge, Mass.*), **Rainmaking and industry.** [1953?] [12 p.] port., photos, diagr. **DWB**—A nicely illustrated brochure explaining the needs of agriculture and industry for controlled precipitation, the scientific basis for rainmaking, and answers to a number of questions raised by various interests on the practical and legal aspects of rainmaking. The general tenor of the answers is optimistic. Operations of Wallace E. Howell, Associates in various parts of the hemisphere (Canada, U. S., Cuba, Peru, etc.) are cited as a testimonial to the soundness of the experiments. *Subject Headings:* **1. Industrial meteorology 2. Artificial precipitation.**—*M.R.*

6J–353 551.509.67

Hales, J. Vern; Hoffer, Thomas E. and Peck, Eugene, **Evaluation of rain making experiments in Utah.** Western Snow Conference, Salt Lake City, April 1954, **Proceedings.** p. 10–18. pub. **1954**. 5 figs., 9 refs. Discussion by Boyd E. Quate, p. 16–18. **DWB**—The technique worked out at the Univ. of Utah for evaluating cloud seeding operations in Southern Utah (by Water Resources Development Corp.) is explained. "The individual percent of monthly normal maps were used in order to reduce the average orographic and local effects. . . . The entire area was divided into

ectangular shaped units ½ degree of lat. by ½ degree of long. . . . There were 692 such small areas n the region studied. The average percent of monthly normal precipitation within each area was ecorded for each month of the analysis, which included 38 unseeded winter months (Oct.–April) om Jan. 1946 to March 1951 inclusive. . . . Each area average was recorded on an IBM card. . . . hus there is a deck of 692 cards for each month."—On behalf of the operating agency, QUATE com- ends the authors for the objectivity of their "near-perfect" method, suggests a few details which ight further improve it, and points out that this type of evaluation program requires a long period f time for conclusive results. *Subject Headings:* **1 Cloud seeding evaluation 2. Punched card nalysis. I. Quate, Boyd E.**—*G.T.*

6J–354 551.509.67

Krick, Irving P., **Weather modification and its value to agriculture and water supply.** *Royal ociety of Arts, Journal*, 102(4924):447–468, April 30, **1954.** 8 figs., 8 refs. Discussion p. 465–468. **LC**—After a brief summary of the early history of cloud seeding, the author gives a detailed survey llustrated by many examples) of the activities of his organization. Basic principles and technical spects of cloud seeding operations, evaluation of their results, benefits to agriculture and water orks, and many other problems are discussed. A summary evaluation of 200,000 generator-hours f operation in the U. S. and six other countries is given, showing precipitation increases from 20 o 70%. A diagram showing the temperature-activity relationships of various freezing nuclei carbon dioxide, silver iodide, loam, clay, loess, soil, sand, ash, kyanite, dust, marl, bentonite, iatoms and spore) is presented. In the discussion, problems of atmospheric moisture balance, verseeding and evaluation are taken up. *Subject Headings:* **1. Cloud seeding in U.S.A.**—*G.T.*

6J–355 551.509.67

Orville, Howard T., **Aims and activities of the U. S. Advisory Committee on Weather Control.** Vestern Snow Conference, Salt Lake City, April 1954, **Proceedings,** p. 1–4. pub. **1954.** Discussion y Robert D. Elliott, p. 2–4. **DWB**—The policy governing the Advisory Committee's activities nd the type of information the Committee is seeking to obtain are outlined. ELLIOTT, speaking or North American Weather Consultants, and rainmaking operators in general, mentions some of he results achieved in cloud seeding, welcomes the unbiased attitude taken by the Advisory Com- ittee, and asserts the necessity for a more rigid legislation to protect from unqualified operators. *ubject Headings:* **1. U. S. Advisory Committee on Weather Control. I. Elliott, Robert D.**—*G.T.*

6J–356 551.509.67

Cloud seeding. *Shell Aviation News*, No. 205:12–13, July **1955.** photos. **DLC**—Cloud eeding operations conducted by the California Electric Power Co. since 1948 in Owens Valley on he east slope of the Sierra Nevada Mountains are briefly outlined. Operations take place during he summer season from airplanes dispensing dry ice which has been found more effective than AgI nder conditions prevailing in that region. Equipment and operations are described and illustrated. iver flow in the area was augmented by 9% during the period 1948–1950. *Subject Headings:* **Cloud seeding in California 2. Owens Valley, Calif.**—*G.T.*

6J–357 551.509.67

Davies, D. A.; Sansom, H. W. and Rana, G. Singh, **Report on experiments on artificial control f rainfall at Amboseli, Kenya, and Dodoma, Tanganyika, 1953-54.** *East Africa. Meteorological epartment, Memoirs*, Vol. 3, No. 3, **1955.** 21 p. figs., tables, refs. **DWB**—Describes experiments ade in southern Kenya (Oct.–Dec. 1953) and Tanganyika (Jan.–March 1954). Finely ground lt was dispersed by the balloon bomb method. Details of the operations and their results are given. valuation of the experiments is based on visual observation; the results, nevertheless "fully confirm veral deductions made from the 1952 Kongwa experiments which were based on an objective nalysis of rainfall records." The general effect of the operations appeared to be light showers llowing the release of hygroscopic particles in suitable large cumulus clouds. *Subject Headings:* **Cloud seeding in East Africa 2. Rain from nonfreezing clouds 3. Amboseli, Kenya 4. Dodoma, anganyika.**—*G.T.*

6J–358 551.509.67

Dessens, H., **Études sur les nuages équatoriaux.** [Study of tropical clouds.] *Puy de Dôme. bservatoire, Bulletin*, Ser. 2, No. 3:76–79, July/Sept. **1955.** photo., 6 refs. **DWB**—The object of he research referred to in this summary report was to study tropical clouds (at Lukolela, Belg. ongo) from the point of view of their suitability for seeding with (a) ice or (b) hygroscopic nuclei. he factors investigated in particular were: (a) existence of convective clouds with tops above the eezing level and lack of natural active freezing nuclei near the tops of such clouds and (b) existence fairly developed convective clouds not reaching up to the freezing level and lack of large hygroscopic uclei at the given place and time. Preliminary reults of the study appear to indicate that condi-

tions in Lukolela frequently favor cloud seeding with both ice and hygroscopic nuclei. Experiments with both types of nuclei were attempted by means of ground-based silver iodide generators and by rockets dispersing salt at 1,300 m. For the former method no suitable means of evaluation was available; the latter does not appear to have yielded any precipitation. The author believes that natural precipitation originating from entirely nonfreezing clouds is negligible in equatorial Africa. *Subject Headings:* **1. Cloud seeding in Belgian Congo 2. Rain from nonfreezing clouds 3. Tropical cloud studies 4. Lukolela, Belgian Congo.**—*G.T.*

6J–359 551.578.45:551.509.67

D'Ooge, Charles L. (*U. S. Naval Ordn. Test Sta., China Lake, Calif.*), **Snowstorm initiation and air temperature.** *American Meteorological Society, Bulletin*, 36(3):127–137, March **1955.** 2 figs., 5 refs. **MH-BH** Data obtained on White Mountain Research Station, Calif., at 10,600 ft (37°30′N, 118°10′W) since Nov. 1948 are divided into 2 groups: 1) 1948–50, *before* intensive cloud seeding projects were begun 30 mi upwind from the station and 2) 1951–3, *during* these experiments. Analysis is based on daily observations of mean temperature for day (°C) and amount and frequency of snowfall of .1″ or greater. 1948–1951 curves are erratic but show marked maximum at −10° to −11°C; the temperature Bossolasco (1954) found for the maximum snowfall frequency at Weissfluhjoch. During 1951 53 when AgI generators were used, a secondary peak occurs at −4°C, which is temperature laboratory experiments show AgI becomes active as freezing nuclei. At 12,500 ft maximum occurs 3°C lower, as shown on curves for point 7 mi N.W. of the station. *Subject Headings:* **1. Snow initiation temperature 2. Cloud seeding evaluation 3. White Mountain Research Station, Calif.**—*M.R.*

6J–360 551.574.1:551.509.67

Fea, Giorgio, **Il programma Italiano sulle ricerche di fisica delle nubi (Collaborazione tra il Servizio Meteorologico dell'Aeronautica Militare e l'Istituto Nazionale di Geofisica).** [Joint cloud physics research program of the Italian Meteorological Service and the Italian Institute of Geophysics.] *Rivista di Meteorologia Aeronautica*, Rome, 15(1):16–20, Jan./March **1955.** 5 refs. French, English and German summaries p. 16. **DLC**—The Italian cloud physics research program comprises: a) observation of natural phenomena (nuclei, cloud structure, electricity in clouds, dynamics of clouds), b) reproduction of such phenomena in the laboratory (cold chamber experiments) and c) experiments aimed at modifying natural phenomena. Cloud seeding experiments carried out by means of silver iodide nuclei in various parts of Italy are briefly mentioned. *Subject Headings:* **1. Cloud physics research 2. Cloud seeding in Italy 3. Italy.**—*G.T.*

6J–361 551.509.67:551.577.21(54)

Fournier d'Albe, E. M.; Lateef, A. M. A.; Rasool, S. I. and Zaidi, I. H., **The cloud-seeding trials in the central Punjab, July–September 1954.** *Royal Meteorological Society, Quarterly Journal*, 81(350):574–581, Oct. **1955.** 3 figs., plate, 2 tables. **DWB**—Salt particles of 10^{-9} to 10^{-8} g were heated by 5–10°C and forced through hand-operated blowers at Lahore and Jaumarabad on 39 days with convective clouds. Rainfall within 100 km on a 50° arc downwind, relative to normal, was significantly higher than in neighboring unseeded arcs. Clouds are below freezing level. *Subject Headings:* **1. Cloud seeding in Pakistan 2. Pakistan.**—*C.E.P.B.*

6J–362 551.509.67

Ludlam, F. H., **Artificial snowfall from mountain clouds.** *Tellus*, 7(3):277–290, Aug. **1955.** fig., 4 tables, refs., eqs. **DWB**—Physical conditions in low clouds which often form over Scandinavia in winter are analyzed. The problems of ice crystal growth by diffusion, formation of ice crystals as a result of seeding, collision between growing crystals and cloud droplets and conditions favoring snowfall from mountain clouds are taken up. Finally, the performance of cloud seeding generators, the amount of artificial snowfall obtainable from mountain clouds (with application to central Sweden), the cost of seeding operations and problems of cloud seeding evaluation are discussed. It is shown that it is reasonable to suppose that winter snowfall on Central Swedish mountains might be substantially increased by skillful seeding of supercooled mountain clouds. *Subject Headings:* **1. Artificial snowfall 2. Cloud seeding 3. Sweden.**—*G.T.*

6J–363 551.509.67

Portugal. Serviço Meteorológico Nacional, **Experiências de estimulação artificial de precipitação realizadas em Hongkong em Maio e Junho de 1955.** [Rainmaking experiments made in Hong Kong in May and June 1955.] Its *Memorias*, RT 240 MEM 66, Sept. 17, **1955.** 2 p. **DWB**—Describes cloud seeding operations during seven-week period May–June 1955 in Hong Kong. A total of 90,000 gal of water were sprayed into clouds from the ground at three locations along the windward slope 90 ft below the Victoria Peak–Mount Gough ridge. Results were observed by 60 gages measuring daily, 10 gages measuring hourly, visual cloud observers, and radar. According to

S. RAMAGE (Dir. of the Royal Obs., Hong Kong), the experiment did not produce increased ecipitation. As the use of dry ice or silver iodide is not practical in Hong Kong it does not appear be possible to augment the rainfall of that region by artificial means. *Subject Headings:* **1. Cloud eding with water 2. Cloud seeding in Hong Kong 3. Hong Kong.**—*G.T.*

6J–364 551.509.67(05)

Puy de Dôme. Observatoire, **Bulletin,** (Ser. 2), No. 1, Jan. 1953—Latest issue seen, No. 3, ly/Sept. **1955.** Quarterly. Editor, H. Dessens. Price: 100 fr./issue. **MH-BH, DWB**—This the first periodical entirely devoted to cloud physics and means of modifying clouds artificially. dited by one of the most active scientists in cloud physics and cloud seeding research, it keeps up th latest progress in all phases of this fast-developing field. Each issue gives original articles sually 2 or 3) contributed by the Puy de Dôme Observatory cloud physicists and other authorities the field. A particularly valuable feature of the publication is its review section which contains tensive and competent summaries of and comments on a large number of recently published works, d reports on meetings and conferences. The periodical is entirely in French, except for a few iginal articles which are in English. (*Same item as* 6B-166, Feb. 1954, *MAB.*) *Subject Headings:* **Cloud physics periodicals 2. Cloud seeding bibliographies.**—*G.T.*

6J–365 551.509.67

Santomauro, Luigi, **Considerazioni meteorologiche sulla lotta contro la grandine.** [Meteorogical aspects of hail control.] *Bullettino dell'Agricoltura,* Milano, 89(26):1–2, July 1, **1955.** 12 fs. **DA**—Structure and dynamics of thunderstorm cells, distribution of thunderstorm precipitation, understorm electricity, and the movement of thunderstorms are discussed. Hail control activities Switzerland and in France and French North Africa are reviewed. The author refutes RUBY's eory of artificial nucleation of thunderclouds by means of silver iodide rockets; RUBY's theory is ased on the assumption of a closed circulatory system within thunderstorm cells, whereas in reality understorm cells are open thermodynamic systems. RUBY also fails to recognize the fact that owndrafts always prevail in the central areas of intense hailfall. Other cloud seeding techniques e also found inadequate for purposes of hail prevention. *Subject Headings:* **1. Hail prevention Switzerland 2. Hail prevention in France 3. Silver iodide rockets.**—*G.T.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

American Geophysical Union, Transactions, Vol. 36, No. 4, Aug. 1955

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Huff, F. A.: **Comparison between standard and small orifice raingages,** p. 689–694

American Geophysical Union. Special Committee on the Geophysical and Geological Stud of Continents, [Report of] the Committee, 1952–1954, George P. Woollard, chairman p. 695–708

American Geophysical Union. Committee on Infiltration. [Report of] the Committee 1953–1954, Leonard Schiff, chairman, p. 709–712

Benioff, H.; Gutenberg, B. and Richter, C. F.: **Progress report of Seismological Laboratory California Institute of Technology, 1954,** p. 713–718

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Sherman, Irving: **Discussion of V. S. Aronovici: The application of the ring infiltrometer t diagnosis of irrigation problems in southern California,** p. 720

Hemel en Dampkring, The Hague, Vol. 53, No. 8/9, Aug./Sept. 1955

De Jager, C.: **De ultra-violette en röntgenstraling van de zon,** [Ultra-violet and X-rays from th sun], p. 153–167

De Jong, J. J. G.: **Ontstond een windhoos in gebied waar twee buien elkaar ontomotten?** [Doe a tornado form in the region where two squalls come together?], p. 168–170

Regenmakers steken hun kop in de tropische wolken, [Rainmakers stick their heads int tropical clouds], p. 170–171

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Japan. Radio Research Laboratories, Tokyo, Journal, Vol. 1, No. 1, March 1954

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Yonezawa, T.: **A consideration of the electron disappearance in the *F2* layer of the ionosphere, Pt. 2,** p. 1

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Takahashi, T.; Onoue, M. and Kawakami, K.: **Character of 200 mc solar noise observation equipment installed at Hiraiso Radio Wave Observatory,** p. 41

Uyeda, H. and Ogata, Y.: **An example of the records of the travelling *F2* layer in the night time,** (*Reprint from Report of Ionosphere Research in Japan*)

Shinno, K.: **On the variation of the *F2* layer accompanying geomagnetic storms,** (*Reprint from Report of Ionosphere Research in Japan*)

Hiraiso. Radio Wave Observatory. Warning Section: **Radio disturbance warnings in Japan,** p. 55

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